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"WILD CAT POINT," LOOKOUT MOUNTAIN, DENVER; SHOWING RUBBLE RETAINING WALL

ROAD CONSTRUCTION IN DENVER'S MOUNTAIN PARKS

More Than Eighteen Miles of Roads Built to Reach Parks in the Mountains Near the City—New Features in Cross-Section and Drainage—Cables as Guard Fences—Natural Scenic Beauty Preserved.

BY O. B. THUM.

The city and county of Denver is now building a system of roads into the mountains leading to and connecting a system of mountain parks, which invite favorable comparison with the beautiful mountain highways of France, Switzerland and Italy. These roads are being paid for by a tax levy spread over a period of five years.

The present plan of Denver's mountain parks system, as shown in Fig. 1, contains approximately 9,000 acres of natural parks and 125 miles of roads. The two largest parks owned by the city are Genesee mountain park and Lookout mountain park, containing 980 and 58 acres respectively.

Since March 1, 1913, Denver has purchased 1,400 acres of land for park purposes, and has either built or assisted in building, in the mountains west of the city, 18.3 miles of well constructed, modern roads. The established maximum grade of these roads is 6 per cent, and the minimum curvature has a radius of 50 feet, which radius, however, is used on only the hairpin turns. The average width of the road is 20 feet.

A cross section of the Lookout Mountain road on a tangent is shown in Fig. 2. The outside edge of the road is six-tenths of a foot higher than the inside edge. Experience with roads of this kind has convinced the designers that in ascending a mountain on a grade varying from 3 per cent to 6 per cent, it is better, instead of crowning the road, to have the road slope uniformly to the inside on tangents and on curves throwing tangents

away from the mountain and sloping to the outside on the curves throwing tangents into the mountain.

The straight cross-section (Fig. 2.) has the following advantage over the curved cross-section:

1. Travel is safeguarded by its inclination towards the inside of the road.

2. The drainage of all water on the surface of the road towards the inner edge protects the outer edge, which is a fill, from being washed away and thus destroying the road.

3. A curved cross-section would encourage more traffic towards the outer edge "B" and greatly increase the danger of accidents.

4. If a curved cross-section was used, traffic and wash would in time eliminate the point "B" and produce a continuous curve from the crown to the slope of the fill, an evil which must in all cases be avoided.

5. The road with a straight crown is much easier and less expensive to maintain than the curved crown road.

6. There is a far greater sense of security on the straight crowned road, especially on curves.

To further promote the sense of security of those who travel on the Lookout Mountain road, several miles of walls and cable-guard fences have been constructed. The walls are 18 inches wide and 2½ feet above the outer edge of the road. They are built of native ashlar granite secured near the work. The wall is made in sections about 20 feet long and a space of 4 feet is left between sections.

These walls have proven unsatisfactory, as they catch and hold the snow during the winter as well as shut off the scenic views below as one passes. The stone posts with the steel cables passing through have proven very satisfactory in every respect, most especially in avoiding the two objections stated above. The posts are built of red, hard, crystallized sandstone, $5\frac{1}{2}$ feet long, with 6x10 inches cross-section. They are set 2 feet in concrete made one part cement to five parts pit run gravel. Through these posts are run two $\frac{5}{8}$ -inch steel cables which are anchored every 350 feet and are required to carry a weight of 350 pounds halfway between the posts without sagging beyond a specified amount.

Drainage is taken care of by corrugated iron, tile or concrete culverts placed not more than 500 feet apart along the road and making an angle of not more than 60 degrees with the center line of the road. It has not been found practical to have culverts less than 12 inches in diameter. On a long piece of tangent road with a heavy grade, wooden V-shaped culverts have been used to carry off the water flowing down the road, and especially to care for wagon wheel track drainage. The apex points



FIG. 3. CONCRETE WALL AND PIPE FENCE.

The building of these roads has produced many unique problems in engineering, and owing to the lack of sufficient convincing information a number of experiments in

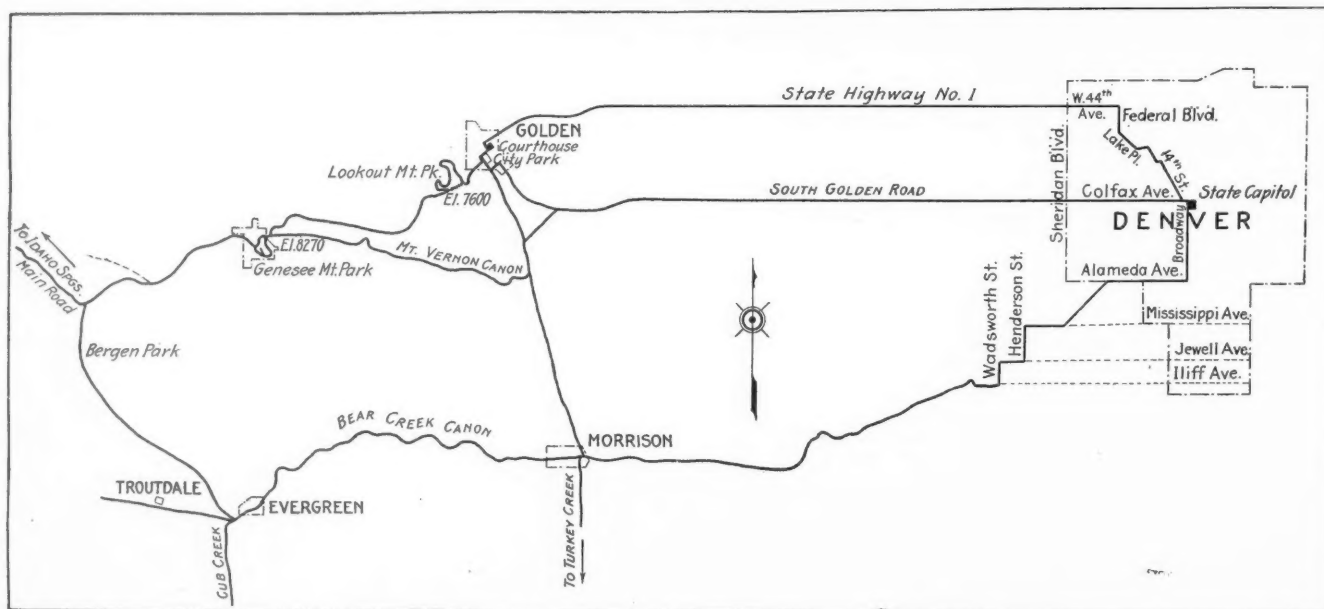


FIG. 1. PLAN OF DENVER MOUNTAIN PARK SYSTEM.

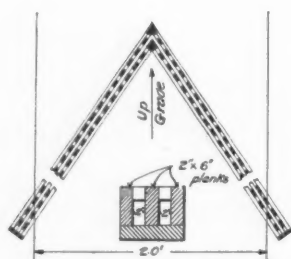


FIG. 4. V-SHAPED CULVERT.

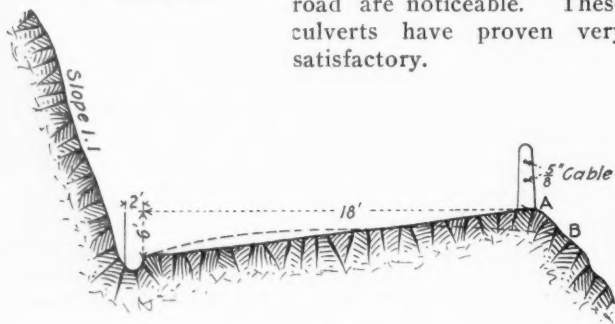


FIG. 2. CROSS-SECTION OF ROAD ON A TANGENT.

up grade, as shown in figure 4. These culverts are made of 2x6-inch planks spaced 2 inches apart. The culverts intercept and carry off the water which runs down the wheel tracks and prevent a washing away of the crown of the road. Their wear is uniform with that of the road, thus no "bumps" in the road are noticeable. These culverts have proven very satisfactory.

road construction have been undertaken, to ascertain the best methods to secure the desired results. In constructing the mountain roads the engineers have not adhered to the theory that it is the best practice to ascend on a constant unchanging grade to gain a certain elevation, believing that experience has shown that a change of grade benefits traffic in more ways than one. A thorough discussion of this theory would prove quite interesting, but is beyond the scope of this article. The roads have been compensated for curvature, a maximum grade of 4 per cent being set as the limit for all curves having a radius of less than 100 feet.

Where a road approaches a sharp curve around a point of rock, signs have been placed requesting automobilists to slow up and blow their horns. Danger signs which it is customary to use in such places have not been used because of the fear which they impress upon the mind of the tourist, and its consequences. A steel rail has been placed on the ground along the center of the road around the curve, forcing traffic to keep to the right and thus avoid serious accidents on sharp curves. Signs giving the elevation above the sea level, the distance from Golden (the starting point of the roads under the control of the Denver Park Commission), the per cent grade, location of

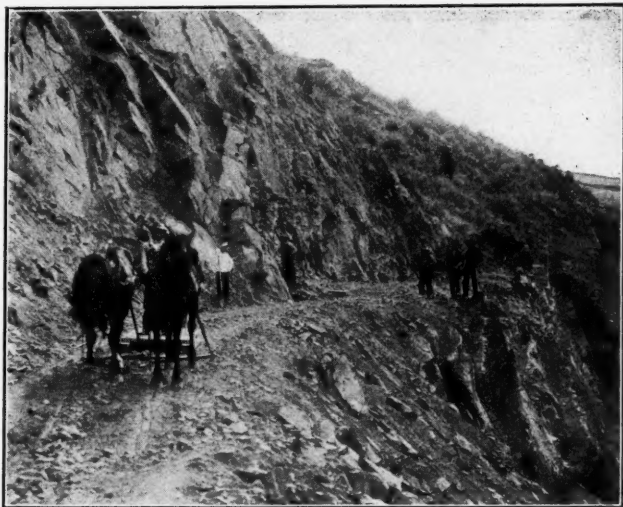


FIG. 5. CONSTRUCTING ROAD ON LOOKOUT MOUNTAIN.

springs, names of scenic points, etc., have been placed on the side of the road.

Rubble masonry walls have been built in most places to hold the fills made in constructing the road. These walls have a batter of $\frac{1}{2}$ to 2. Figure 3 shows a concrete wall at Sensation Point. This is the only place on the entire route where it has been necessary to use this kind of a wall. This wall is 125 feet long and 18 feet maximum height. It is built of reinforced rubble concrete, 3 feet wide at the bottom, with an outer batter of .03 inch to the foot, the reinforcing being 2-inch hollow pipe. When the top of the wall was constructed, holes for the railing

posts were made by means of inserting 3-inch circular collapsible tin forms one foot deep into the center of the coping, these being spaced 8 feet apart. When the concrete had set, the tins were easily removed and the 2-inch gaspipe posts were set and firmly imbedded in the concrete. This wall does not act as a retaining wall, but merely as a support for the railing.

All work has been done in a careful way so that the natural scenic beauty might be preserved. In order to secure this, the engineers, have, in a general way, preserved all the shrubs and trees near the roadside, and in several instances the road line has been changed so that this effect might be accomplished. Great care has also been taken to preserve the natural shrubbery near the road from the destructive effects of blasting, rock-slides, temporary trails, etc. Plans have been perfected whereby the barren spots adjoining the roadside and lookout points will be made more attractive by transplanting certain varieties of deciduous and coniferous trees, as well as native shrubbery. A game enclosure for elk is now being prepared in Genesee Mountain Park.

A general idea of the cost of these roads is given in the following average per mile:

DESCRIPTION.	COST PER MILE.
Hairpin turns, no timber or shrubbery, 40 per cent rock, 30 per cent earth, 30 per cent disintegrated granite	\$19,008.00
Hairpin turns, no timber, 80 per cent earth, 20 per cent loose rock	17,598.00
No timber, 90 per cent rock, 10 per cent earth.....	13,474.00
Heavy timber, 75 per cent rock, 25 per cent earth...	10,598.94
No timber, 50 per cent earth, 50 per cent rock.....	7,710.47
No timber, 75 per cent earth, 25 per cent rock.....	3,516.48
No timber, 100 per cent earth.....	2,578.03

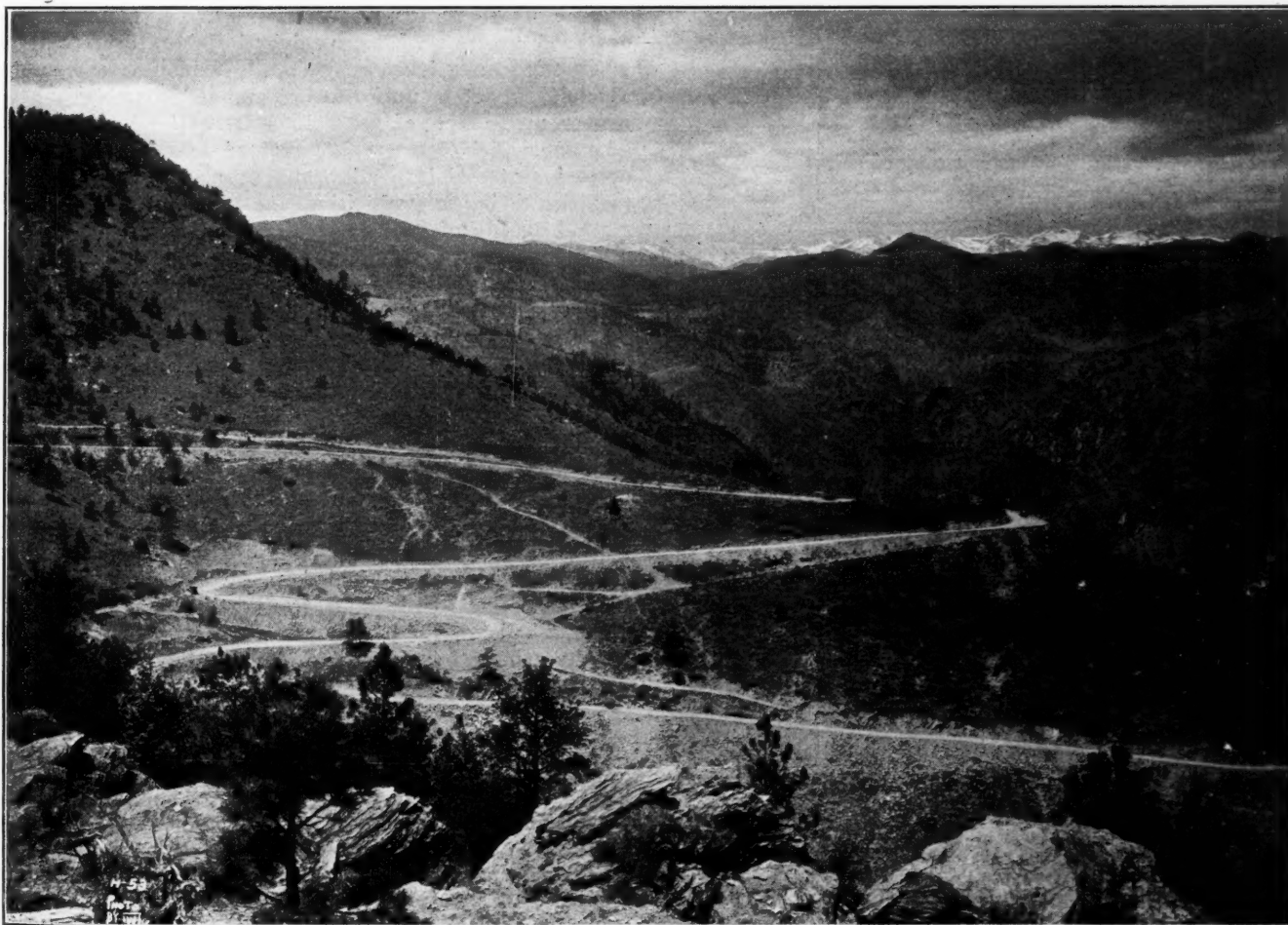


FIG. 6. HAIRPIN CURVES, LOOKOUT MOUNTAIN ROAD.
Ascending Without Exceeding Maximum Limit of 6 Per Cent Grade.

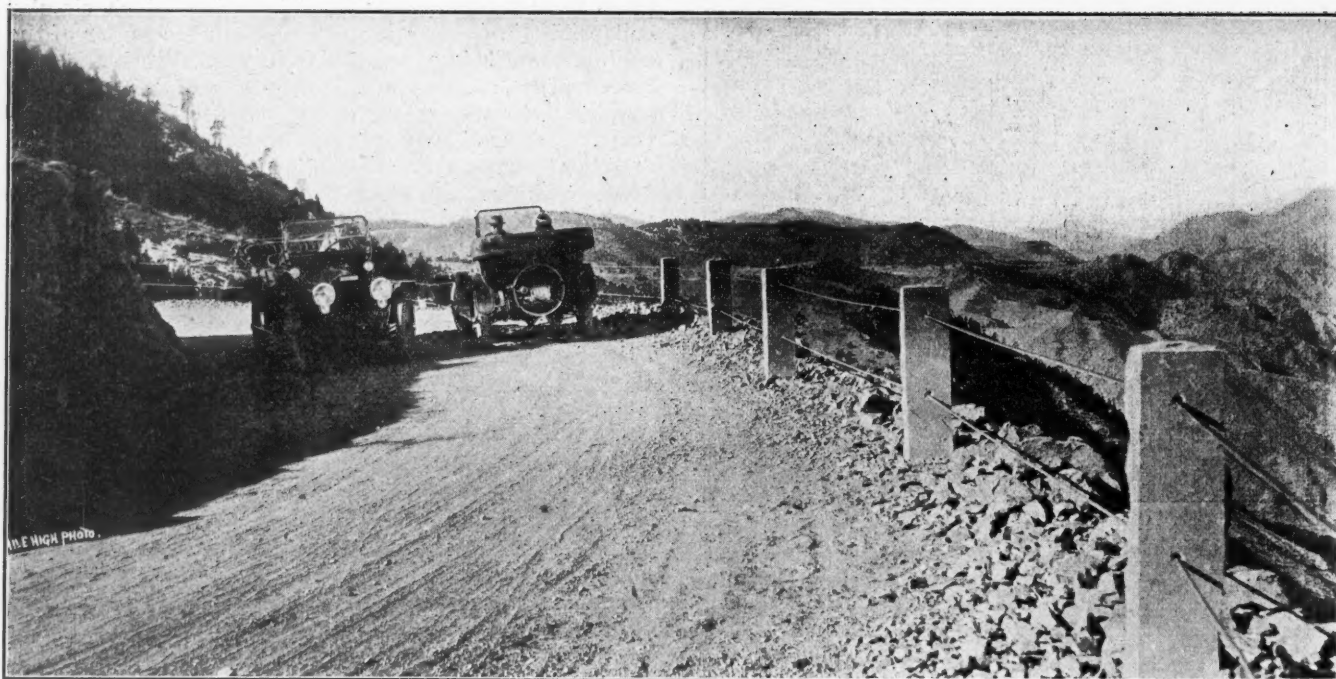


FIG. 7. "WINDY POINT," SHOWING WIDTH OF ROAD AT TURN AND STEEL CABLE FENCE.

All road work is done by day labor, the foremen being paid \$3.00 per day, laborers \$2.50 and teamsters with teams \$5.00 per day. The guard fences are being constructed by contract. The roads are being maintained by the patrol system, two men being able to maintain five miles of road.

SAND FOR CONCRETE PAVEMENTS

Practice, Tests and Specifications of New York State Highway Commission—Stone Screenings Used Only if Mixed with Sand—Compression Test.

In a paper before the American Portland Cement Manufacturers, H. S. Mattimore, first assistant engineer of the New York State Highway Commission, discussed the methods employed by that commission in testing aggregate for concrete pavements, chiefly the fine aggregate. Concerning this he said:

"To insure a fine aggregate of high grade our department has drawn up the following definite specifications:

Fine aggregate shall consist of sand, free from organic matter; that which shows a coating on the grains shall not be used until satisfactorily washed.

No. 1 sand for use in concrete pavement shall be of the following gradation: 100 per cent shall pass a $\frac{1}{4}$ -inch screen; not more than 20 per cent shall pass a No. 50 sieve and not more than 6 per cent shall pass a No. 100 sieve. Sand may be rejected for this class if it contains more than 5 per cent of loam and silt.

Mortar in the proportion of one part of cement to three parts of the sand to be tested, shall develop a compressive strength at least equal to the strength of a similar mortar of the same age composed of the same cement and standard Ottawa sand.

Screenings when approved in writing by the Chief Engineer may be substituted for a portion of No. 1, 2 and 3 sand under the following conditions.

The screenings shall be free from dust coating and other dirt, 100 per cent shall pass a $\frac{1}{4}$ -inch screen and not more than 6 per cent shall pass a No. 100 sieve.

The compressive strength of a mortar, in which the screenings and sand are in the proportions intended for use, shall be at least equal to the standard strength obtained with sand of the given class.

"You will notice from the specifications quoted above, that the only allowable use for stone screenings as fine aggregate, is when mixed with a proportion of sand. We have had some field tests made on using all screenings for fine aggregate and these have shown such doubtful results that it was not thought advisable to replace all of the sand by screenings. It is possible to get good concrete with screenings in laboratory test, but when tried on a large scale in the field it is extremely difficult to get a uniform well graded material. The proper proportion of screenings from the hard variety of stone will improve a fine grained sand, but the high costs for careful inspection and proper mixing is likely to make their use prohibitive, except in instances where a good quality of sand is very expensive.

"There being no standard tests for sands, the following is a brief outline of the tests and methods employed in our laboratory.

"Gradation—One thousand grams of the sand to be tested, after a careful weighing, is screened through the $\frac{1}{4}$ -inch, No. 6, No. 20, No. 50, No. 100 and No. 200 mesh sieves. After weighing the residue on these sieves, the proportions passing are readily computed. We found from past experiences that these are the essential sieves for an intelligent judgment of the gradation.

"Voids—For the determination of the voids, the sand is placed and loosely compact into a graduated cylinder. This latter has a hole drilled in the bottom in which a tube is connected leading from a burette filled with water. This apparatus is placed and worked so that gravity causes the water to rise slowly through the sand, forcing the air ahead. By reading from the burette the amount of water which has flowed out, the voids can be computed within a practical degree of accuracy. This method of allowing the water to flow in from the bottom rather than from the top of the sand, eliminates the forming of air pockets, which are extremely difficult to avoid by the latter method.

"Loam—For the determination of the amount of loam, a portion of the sand sample is placed in a graduated cylinder and well covered with water. This is thoroughly agitated and then allowed to settle from ten to twenty-four hours. The loam and silt, which readily

separates from the sand, is deposited on top of the sand and the proportions can easily be computed. This method of loam determination by volume, we believe is as refined a determination as necessary to fit all practical requirements. It also allows an easy method of checking in the field.

"Compression tests—The majority of our compression tests are made on 3-inch cubes mixed 1 part of cement to 3 parts of the sand. These are stored in moist air and broken in 14 days; 4 cubes are made from each sand, 2 from the natural product and 2 from the washed. For a comparison of the compression, four cubes of the same size mixed with standard Ottawa sand and the same cement are made, stored and broken under the same condition and at the same age. The cement used for this purpose is a blend mixed in the laboratory from cements which show similar characteristics under tests. The cement and sand in the cubes are proportioned by volume rather than weight to avoid the variation of the latter in sands of different character. The cement although measured by volume is carefully checked by weight to eliminate different degrees of compactness in measuring.

"At the present time we are running a series of sand compressions on both two and three-inch cubes for the ultimate purpose of using the smaller size cube. These latter will be made up in lots of four, two of which will be broken at seven days and two at twenty-eight days. This in many cases will decrease the time necessary for a sand test and also enable us to observe the relations of the strengths at the different ages.

"Of our tests we consider the compression strength of the sand in mortar of major importance, but as this depends more or less on other determinations, especially gradation and per cent of loam, silt or organic matter, it is advisable to run a full test in order to properly judge the material.

"Occasionally sands are tested for tensile strength, but our experience on the relation between tension and compression strengths of sand mortars has verified the results obtained by other investigators in the fact that this relationship is so non-uniform that it is absolutely unreliable, and as we build plain concrete to withstand compression rather than tension, we should test it from that standpoint."

From field tests the following results were obtained: The average compressive strength of 18 cubes of stone and screenings concrete was 2,250 pounds; of 40 cubes of gravel and sand concrete, 3,105 pounds, and of 366 cubes of stone and sand, 3,520 pounds. All were taken from concrete mixed for actual use in pavement construction, proportioned 1:1½:3, and tested after 28 days.

The effect of loam is illustrated by cubes from two sands, the chief difference between which was that one contained 9.2 per cent. loam and the other 4.8 per cent.; the former showing 2,975 pounds compressive strength as compared to 4,610 for the latter.

PROTECTING HIGHWAY EXPENDITURES.

In handling maintenance work, a semi-monthly pay system has been established by the Pennsylvania State Highway Department. Individual checks are issued from the Harrisburg office for each laborer and for the hire of all teams, these checks (in sheets of six) being issued in triplicate, the original when signed is sent out for payment, the duplicate transmitted to the bank, and the triplicate placed on file in the office. Before the original check is paid by the bank, it is compared with the dupli-

cate placed there on file, the department being thus protected against error and fraud.

In purchasing material, a purchase order system is used, requisitions being filed in the office of the department for material desired; and after being approved by the maintenance engineer, a purchase order for same is drawn, which, before becoming operative, must likewise be approved by the chief engineer. The protection of such system can readily be seen, and the prices secured are equal to and in many cases better than those secured by private corporations throughout the state.

A CALIFORNIA CONCRETE ROAD*

Construction Methods on a Bituminous Covered Road— Unit Costs—Two Kinds of Bituminous Surfacing Used.

A portion of the San Joaquin valley artery of the state highway which has been constructed and under traffic for a longer period than any other road in that section is a 9.55-mile piece extending northwesterly from the city of Fresno to the banks of the San Joaquin river. The pavement consists of a 4-inch base of portland cement concrete, 15 feet wide (with 3-foot earth shoulders), covered with an asphaltic wearing surface. Though it is now about two years since the road was first thrown open to traffic, with the exception of slight repairs to the oil surfacing and the dirt shoulders, no maintenance has been required.

The contract for the construction of the road was let in August, 1912, to the Worswick Street Paving Co., of Fresno. The laying of the concrete pavement was begun in October, 1912, and finished in April, 1913.

In order to secure a good foundation, the old road of macadam was scarified, pulverized and harrowed. It was then wet thoroughly and rolled until it showed no movement under the roller. Timber headers of 2 by 4-inch, placed on edge and securely nailed inside supporting stakes, were placed along the outside as pavement forms. These headers conformed to the lines and grades of the finished pavement and the subgrade was then shaped to the finished grade of the bottom of the concrete by a wooden template, the bottom of which was approximately 4 inches below the finished crown of the concrete. By "approximately" is meant that the subgrade was usually finished a little above the final grade, depending on the nature of the material forming the foundation, and the final wetting and rolling compacted it to the desired grade. The grade was kept clean and thoroughly wet immediately in advance of the concrete, to insure obtaining the full thickness and to prevent any water from the concrete being absorbed by the subgrade.

A Foote 2-3-yard mixer was used throughout, the concrete proportions being 1:2½:5, and the concrete was mixed with just enough water to be of a jelly-like consistency, care being taken not to mix it wet enough so that the mortar would flow away from the aggregate, with a resultant lean mixture. After being placed, the concrete was struck with a template riding on the header boards. This was followed up sufficiently close with wooden tampers and smoothed with a wooden float. There was sufficient roughness on the finished surface to insure the oil wearing surface adhering thereto.

Concrete was run during 104 days at an average of 484 lineal feet per day of concrete run. On 24 days out of the 104, over 700 lineal feet were laid and on 6 days over

*From an article by James B. Woodson, Div. Engr., in the California Highway Bulletin, the monthly publication of the department.

800 feet. The highest run for any eight hours was 857 feet with the following crew:

1 Foreman	\$4.00
1 Engineer	3.50
1 Water tender	2.00
1 Chute man	2.40
4 Chute men at \$2.00.....	8.00
11 Wheelers and shovelers at \$2.00.....	22.00
1 Wheeler	2.25
2 Men handling planks at \$2.00.....	4.00
2 Men smoothing concrete at \$2.00.....	4.00
1 Man tamping	2.00
1 Man brooming	2.00
2 Men handling cement at \$2.00.....	4.00
1 Wagon spotter	2.00
1 Two-horse wagon and driver (handling boards).....	4.50
1 Man helping (handling boards).....	2.00
1 Concrete mixer, fuel, etc.....	5.00
1 Pump and engineer.....	6.00

33 Men, total on concrete work..... \$79.65
857 lineal feet = 158.7 cubic yards = \$0.503 per cubic yard or 5.6 cents per square yard of concrete 4 inches thick.

In order to secure water for mixing the concrete and wetting the subgrade, wells were drilled at convenient points where irrigation canals or old wells were not available. The water was pumped through 2-inch pipe for approximately a mile on each side of the well. In this way sufficient water was secured to wet the subgrade, mix and place the concrete and keep it wet for six days.

The construction of a satisfactory 4-inch pavement allows practically no leeway in any departure from the specifications. Coarse aggregate for concrete that runs a high percentage of materials passing a one-inch screen, requires an excess of sand to get the finish and therefore makes a weaker mixture of concrete than the specified quantity of sand. Also, too much material in the coarse aggregate passing a $\frac{3}{4}$ -inch screen reduces the quality of the mixture due to the fact that sufficient tests cannot be made rapidly enough to adjust the sand at the mixer. The aggregate on this job was entirely of clean gravel from the Friant pit and was well graded from $\frac{1}{4}$ -inch up to $2\frac{1}{2}$ inches. The sand also was from the same pit. Great care was taken to eliminate the clay mixed with the sand pit. Frequent tests were made, both in the division office and by the resident engineer on the work, to determine the amount of objectionable matter in the aggregate. Material that tested 6 per cent by weight in material passing a No. 100 screen (which was classified as silt) was considered as not satisfactory.

Some cracks appeared in the road at fairly regular intervals of from 25 to 35 feet, but no bad results have been occasioned by reason of these. The first concrete laid was opened to traffic seven months before the oil surfacing was applied and on this section there was no appreciable breaking down or disintegration of the aggregate. With the oil surfacing completed and the concrete now about two years old, these cracks can hardly be located.

In order to determine an adaptable wearing surface that could economically be applied, two types were placed on this section.

One was a mastic mixture consisting of a composition of approximately equal parts of asphaltic cement, 70 to 80 penetration, and powdered lime rock spread to a thickness of $\frac{3}{8}$ inch, on top of which, after laying, was spread broken stone screenings or coarse sand as needed to absorb the excess of bitumen as it appeared on the surface or as the mixture softened under the heat of the sun.

The other surfacing consisted of an application of approximately $\frac{1}{2}$ gallon per square yard of asphaltic oil spread at from 250 to 300 F. containing 90 per cent of 80 penetration asphalt, on top of which was spread sufficient sand or screenings to absorb the oil. Approximately 0.488 gallons of 90 per cent asphaltic oil per square yard

and 260 tons of screenings per mile making 0.03 tons per square yard were used, making a final thickness of slightly less than $\frac{1}{2}$ inch.

Summary of Costs.

	Total cost.	Per mile.	Per square yard of concrete.
Grading	\$8,591.40	\$900.00	\$0.102
Concrete base (including cement)	49,358.92	5,168.48	0.587
Bituminous surfacing (including mastic)	7,730.19	809.44	0.092
Culverts, monuments, guard rail, etc.....	820.32	85.90	0.009
Totals	\$66,500.83	\$6,963.82	\$0.790

RESURFACING WATER BOUND MACADAM

Methods and Itemized Costs of Reconstructing Old Macadam and Surfacing with a Tar Mixture—Hours of Labor and Quantities of Material.

BY S. CAMERON CORSON.*

In submitting the following items of cost of resurfacing an old water bound macadam street I want to particularly emphasize the fact that I believe a municipality can do better work for less money than by letting the same work out by contract. To insure good work by contractor the municipality should be represented by a competent inspector whose duty would be to stay on the job and to supervise the work and see that the specifications are rigidly carried out. This inspector would be paid a salary commensurate with his ability. The cost of this service would be added to the contractor's percentage of profit, thereby increasing the cost of the work over and above the cost of similar work if done by the municipality, under the direction and supervision of a member of the regular engineering staff of the Highway Department.

This street was macadamized many years ago, using crushed furnace slag. The gutters were three feet wide, one line of brick laid at right angles to the curb, then adjoining the bricks the gutter was made of flat irregular stone laid in sand. The distance between curb lines is 36 feet.

Maple trees had been planted along the curb, but too close to allow the natural spread of the tree and their roots, consequently the curbstones were in many places forced out of line and grade, and to reset the curbstone to the revised lines and grades necessitated considerable labor and expense, which, by ordinance, is paid for by the property owners.

There was a cross fall of at least 15 inches between the curb lines and to reduce this the grade of the north curb line was lowered .25 of a foot and that of the south curb line raised an equal amount; then new gutters were constructed, the north gutter being lowered to ten inches below the curb, and the south gutter raised to give a four-inch curb. These changes were all the differences that could be allowed under the existing circumstances, and they necessitated considerable handling of materials to lower the old street surface to meet the new conditions.

The construction of the vitrified brick gutters was done under our standard specifications, as follows:

As soon as the curbstones had been reset to line and grade, the joints between each pair of stones was filled with good stiff cement mortar to hold the grout.

The old gutter stones were removed and the excavation made to conform to the 10-inch curb face plus

*Borough Engineer of Norristown, Pa.

the depth of the bricks, 4 inches, sand $1\frac{1}{2}$ inches, and cinders 8 inches, on the north side, and 6 inches less on the south side. Engine cinders were then spread about 10 inches thick, wet and rammed down to a depth of 8 inches. Over this clean bank sand was spread to a depth of $1\frac{1}{2}$ inches, and drawn to grade by a template board.

On this sand bed were laid the vitrified bricks at right angles to the curb, 3 wide with a running course on the outside. The bricks were then thoroughly rammed by using an oak plank 3 inches thick, 10 inches wide and 6 feet long, moved uniformly 6 inches out to the edge of the gutter. Then all broken or damaged bricks were replaced by good ones.

Grout was prepared by mixing one part of approved Portland cement, two of bar sand and enough water to make the mixture the consistency of cream, and this was dumped from the grout box on to the gutter, the laborers using street brooms to sweep the grout into the joints. After this first coat had been allowed to set up, the finishing coat of one cement to one bar sand was broomed over the surface and the gutter then given a light coat of sand. This work was allowed to stand undisturbed for at least 72 hours before we proceeded to build the macadam road.

After the street had been rooted up, all of the larger sizes of slag were forked out to make a new Telford bottom, and so much of the sizes down to $\frac{3}{4}$ inch was used as could be saved by reforking, using forks with less than this distance between the tines. The balance of the material, consisting of the smaller sizes of slag,

COST OF CONSTRUCTING "UGITE" MACADAM.

Total length, 646 feet. Width between outside of gutters, 30.8 feet. Area, 2,218 square yards.

1,292 lineal feet gutter cost \$493.02, or 38c. per foot, as follows:

15,050 McAvoy No. 2 blocks at.....	\$18.00	\$ 270.90
22 bags cement at .....	.31	6.82
By contract, laying 390 sq. yds. gutter, at ..	.47	*183.30
Hauling 16,000 blocks at, \$ per M.....	2.00	32.00

Total\$ 493.02

*The above rate of 47c. per square yard of brick gutter included excavation for the gutter, removing excavated materials, furnishing ashes and sand and spreading the same, laying the blocks, ramming and grouting.

SUBGRADE AND MACADAM.

Foreman	70 hours at \$.35	\$ 24.50
Labor	1,034 hours at .17½	181.95
Spreading crushed stone...	110 hours at .20	22.00
Spreading crushed stone...	110 hours at .17½	19.25
Spreading trap rock screenings	17 hours at .20	3.40
Spreading trap rock screenings	129 hours at .17½	22.58
Horses and carts, hauling on screenings	42 hours at .30	12.60
Horses and carts, hauling away excess materials which was sold	245 hours at .30	73.50
Roller engineer	35 hours at .25	8.75
Coal for roller.....	1½ tons at 5.00	7.50

\$ 376.03

388.5 tons $1\frac{1}{2}$ in. limestone at.....	.75	\$291.38
25 tons $\frac{3}{4}$ in. limestone at.....	.75	18.75
45 tons trap rock screenings at.....	\$1.14	51.30
Freight on 413.5 tons at.....	.30	124.05
Hauling 458.5 tons at.....	.40	183.40

\$ 668.88

3200 gals. "Ugite" delivered on the street at 9½c per gallon		304.00
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Total		\$1,348.91
Credit by 372 loads dirt at 5c.....	\$18.60	
Credit by 35 loads gutter stone at 45c....	15.75	
		34.35

Net cost\$1,314.56

Total area between curbs, including the brick gutters, 2585.2 square yards, or 70 cents per square yard; or for the "Ugite" macadam, 59½ cents per square yard.

dirt and street accumulations, besides the excess from a number of trenches that had recently been dug in the street for gas, water and sewers, was sold for filling.

Limestone was spread over the slag base to give a new crown to the street and fill up all uneven places, the larger bottom stone and slag were thoroughly rolled and all uneven places filled to the subgrade; then "Ugite" was spread on the limestone by an automatic auto sprinkler, which gave a very even coating of the binder. Over this was spread $\frac{3}{4}$ inch limestone to fill the voids in the large base stones. This was again rolled and a second coating of "Ugite" spread over the whole surface, immediately followed with just enough trap rock screenings to take up the "Ugite" and to fill the smaller voids, and again thoroughly rolled. This made a street surface that, having gone through a severe winter and a hot dry summer (a portion of which was a drought which lasted 105 days), has demonstrated what can be done for so little money.

NEW YORK HIGHWAY WORK

Improving Town Highways Under Department Guidance —Maintenance by Patrol and by Gangs—Convict Labor—Traffic Census.

The highways in New York State are divided into three classes—state, county and town. The first total about 3,800 miles, the second about 8,700 miles, while the town highways approximate 67,500 miles. The mileage of town highways is being continually reduced by the improvement of certain of them each year by state or county. The cost of constructing town highways is borne jointly by the state and the towns, but the state has no jurisdiction over the maintenance of town highways.

The Town Bureau of the State Highway Department is under the charge of the third deputy, and he has supervision over the expenditure, not only of the money contributed by the state but also of money raised locally for highway purposes. The law requires that the town officials keep uniform systems of accounts upon blanks furnished by the department, that written contracts be entered into to determine the places where and the methods under which the highway moneys shall be expended in the town, and that copies of these agreements be filed in the department. The expenditure of the state's money under the supervision of the department has resulted in a wonderful improvement in general road conditions throughout the state.

The law passed in 1909 provided for the election by boards of supervisors of a county superintendent of highways in each county, who should have supervision over town highway expenditures; these county superintendents being selected from a civil service list. Between these county superintendents and the third deputy are ten district supervisors, who represent the deputy in the field, each of which has charge of a district comprising approximately 7,000 miles of road.

One of the plans of the bureau is to secure a widening and standardizing of all the earth roads in the different towns, and a very large percentage of all the roads have now been properly widened, shaped and crowned so that travel over them is safe and convenient for any kind of vehicle. In addition to this, a constantly increasing mileage of roads have been improved with macadam, gravel or stone base with a crushed stone or gravel top. During the fiscal year ending in 1914, 454 miles of town roads were macadamized and 390 miles finished with gravel, making a total of 3,363 miles of macadam and 5,430 miles of gravel in the system of town roads. To provide for this work, the towns raised last year a highway tax of \$3,250,091; to

which was added as state aid \$1,815,919, and about \$310,000 had been left as a balance from the previous year. The towns also raised \$1,499,839 for bridge purposes, \$358,811 for machinery and tools and \$749,797 for miscellaneous purposes. These funds are paid out by the district supervisor upon vouchers issued by the town superintendent, which vouchers carry all necessary details regarding the purpose for which each is drawn.

During the winter the district supervisors audit the highway accounts of the different towns.

MAINTAINING HIGHWAYS.

The maintenance of the state highways of New York is in charge of a second deputy. In the report of the latest fiscal year, Paul Schultze, who occupied that position, described the work of the maintenance department as follows:

"Ordinary repairs on the less worn highways were made by patrolmen paid \$3 per day, appointed by the head of the department. Each patrolman was assigned to about five miles of highway. The patrolmen furnish a horse and wagon and the minor tools and implements. The department furnishes him the various sizes of broken stone, sand, heating kettles and bituminous material. With this equipment on the lesser traveled highways, the patrolman has been able to keep up the wearing surface in first-class condition, to preserve intact the bottom course and to reduce the cost of transportation to a minimum.

"On roads which were not much worn or heavily traveled in the vicinity of the large centers of population, it was found necessary to employ the gang system to supplement the work of the patrolmen. Generally speaking, a gang consisted of a foreman paid \$4.50 per day and from twelve to fifteen laborers paid \$2 per day. The materials, tools and implements were furnished by the department.

"Where bituminous surfaces were not worn out, but had become extremely rough (and this condition prevailed through many hundreds of miles) the gang system was employed. The rough surfaces were removed and sufficient new material added to construct smooth and serviceable wearing course. The excavated materials were not wasted but were used in widening out and improving the shoulders or wings of the highways, thus widening the roadway, prolonging the life of the highway and making the passage of vehicles safe and convenient.

"Where the top surface was very rough and full of holes, the gang system was employed, and in two divisions was supplemented by the use of motor trucks. Four 3-ton, one 4-ton and one 5-ton motor trucks were purchased. The motor trucks were used to transfer the men, tools, implements and materials. The use of trucks more than doubled the amount of labor which each gang performed and greatly benefited the traveling public in lessening the period that the road was under repair. By so arranging the trucks that the bodies may be removed and pressure distributors mounted in their stead, a still further economy will be effected and the necessity of purchasing the ordinary type of distributors will be obviated. For the same reason there were purchased two 10-ton and three 6-ton tandem rollers.

"Where the top course was entirely worn out, a new course was added after plans and specifications were prepared by this department. This work was done by contract after due advertisement and competitive bidding.

"Where the top and bottom courses were entirely worn out the whole road was reconstructed by contract after similar competitive bidding. In every instance the cause of the road failure was ascertained and wherever it was found due to defective original plans, then the type was changed and a more durable form of construction adopted. This was especially true in the vicinity of larger cities, where many miles of brick and concrete pavements

have been constructed to replace the less durable type of construction.

"The repairs of brick pavements, which are comparatively few, have been made by the gang system and no patrolmen have been appointed on brick roads.

"Approximately 1,500 miles of road were treated with bituminous material and covered with sand, screenings or gravel. In six divisions this work was done by gang system. Twenty-eight pressure distributors were used in this work.

"In three divisions the work of applying a bituminous carpet was done by contract after competitive bidding upon properly prepared plans and specifications. This plan proved eminently successful. The most important feature in producing this desirable result was the large mileage of the individual contracts running as high as 100 miles in length. This method attracted the most responsible and competent contractors who performed their work much cheaper than the method in force in the other divisions."

CONVICT LABOR.

During the past summer, men from the various New York State prisons were employed on State road work. The Great Meadows prison sent six gangs, aggregating 225 men. One camp of 25 men was sent from Clinton and 60 men from Sing Sing were employed on State road work at Palenville in the Catskills. Auburn sent 170 prisoners, all but 18 of whom were short term men.

These 480 men were employed throughout the rural districts in constructing dirt and gravel roads. The experiment last year was considered a success and this method of building roads is favored by road and prison officials and the prisoners themselves.

A gang or camp is composed of from 15 to 40 men. Each camp is under the charge of an officer and in addition there are a day watchman, a night watchman and a keeper. The camps were run on the honor system and after 8 hours of labor the men were free to do as they wished until the time fixed for retiring.

TRAFFIC CENSUS.*

Late in the summer of 1914, when traffic was near a maximum, a census of traffic on the improved roads of the State of New York was taken. All vehicles passing over the roads were counted and classified according to kind. This was done in conformity with the general plan of the highway department, to get a complete history of each improved road in the state. This history was to include not only facts of interest in regard to the construction and maintenance of the road, but also the cost of construction and of maintenance reduced to some standard unit. To do this required that information be collected as to the burden each road was carrying and its condition at stated times.

In the actual work of tallying, approximately seven hundred men were engaged and the traffic on nearly one thousand separate highways was recorded. This was accomplished by the department without employing any new men and without any direct additional cost.

A letter was sent to each patrolman in the state, directing him to lay aside his usual repair work on two specific Saturdays and take up his position at some spot on the highway to which he is regularly assigned and to record the number and class of passing vehicles on a formal tally sheet, several of which were inclosed in the letter. He was directed to select, if possible, a position that would enable him to record the travel on two or more highways at once.

The department has not yet completed the work of reducing and tabulating these figures which will be pub-

*From an article by Philip Farley, consulting engineer, N. Y. State Highway Department, in "N. Y. Highway News," the publication of the department.

lished later; but when this work is completed, it will have on hand a record of the travel on about 1,000 highways for two distinct days (both the same day of the week, however). The average of the results for these two days will be assumed to give the volume, weight and character of traffic on the roads of the state. While great accuracy is not claimed for these records, there is a sufficient degree of it to determine the relation between work done and cost of maintenance.

Following is the type of tally sheet sent out by the department:

State of New York
COMMISSION OF HIGHWAYS
Traffic Census

Name of Road.....
Station..... Highway No.
County
Date..... Time..... A. M. to..... P. M.
Condition of Weather.....

VEHICLE.	Tally.	Total.		
Motorcycles.....
Motor Runabouts...
Motor Touring Cars.
Motor Trucks.....
Total Motors.....
One Horse, Light...
One Horse, Heavy...
Two Horse, Light...
Two Horse, Heavy...
Total Horse Drawn.
Total Both Classes..

REMARKS:

COST OF HIGHWAYS IN THREE STATES.

The Office of Public Roads has compiled a table of costs of gravel, macadam and bituminous macadam road construction in the states of Maine, Massachusetts and New Jersey for the years 1908 to 1911 inclusive. Massachusetts apparently built no gravel roads during those years, nor is any waterbound macadam included for that state, but only bituminous macadam. The costs of gravel roads are reduced to those for an equivalent road 20 feet wide, and those for waterbound and bituminous macadam, to roads 15 feet wide; and the costs are divided under the heads of drainage and grading in one column, and surfacing in another. The several averages for each state, together with the maximum and minimum costs of individual roads, are given in the accompanying table:

Average Costs of Road Construction in Three States.						
	Gravel per mile of equivalent 20 ft. width.		Water Bound Macadam per mile of equivalent 15 ft. width.		Bituminous Macadam per mile of equivalent 15 ft. width.	
	Drainage and Grading.	Surfacing.	Drainage and Grading.	Surfacing.	Drainage and Grading.	Surfacing.
Maine:						
1908	\$3,089	\$2,028	\$1,679	\$3,449	\$1,855	\$7,685
1909	3,714	1,720	1,978	4,033	.....	.....
1910	2,197	2,316	1,624	3,913	5,670	7,310
1911	2,254	2,384	1,812	4,954	1,710	6,490
Maximum	7,545	5,714	4,580	7,370	5,670	8,220
Minimum	427	371	240	1,320	930	5,650
New Jersey:						
1908	2,287	3,533	3,312	6,867	.....	.....
1909	2,292	2,289	4,363	6,524	2,513	8,418
1910	1,895	2,301	4,138	6,205	2,876	8,519
1911	2,240	4,828	2,054	5,714	3,004	11,034
Maximum	6,805	12,285	11,510	12,060	6,370	15,290
Minimum	600	999	160	860	430	4,890
Massachusetts:						
1911 .....	.....	.....	.....	.....	2,754	6,869
Bit. surface coat .....	.....	.....	.....	.....	3,267	4,999
Five ins. of gravel and a bit. surface coat .....	.....	.....	.....	.....	2,204	3,328

The gravel roads had an average width for all roads in both states, of 20 feet, those in Maine varying from 15 to 40 feet and those in New Jersey from 12 to 42 feet. The total amount of gravel roads entering into this calculation was 143.53 miles.

The waterbound macadam roads in both states averaged 15 feet in width, varying from 15 to 47 feet in Maine and 14 to 18 feet in New Jersey; the great majority in the latter state being 14 feet and thus accounting for the low average width. The total amount of waterbound macadam was 137.51 miles.

Figures are given for 84.63 miles of bituminous macadam roads in Maine, New Jersey and Massachusetts; in the latter state for 1911 only. These roads averaged 15 feet in width, but those in Maine varied from 21 feet to 46 feet wide, and those in New Jersey from 14 to 16 feet, with one short road 30 feet wide, the majority being 14 feet. All of the roads reported for Massachusetts were 15 feet wide. The costs are reduced to those for equivalent roads 15 feet wide. The average cost of all the bituminous macadam roads referred to per mile of equivalent 15-foot width was \$2,765 for drainage and grading and \$7,533 for surfacing.

LOADING STONE WITH A CRUSHER ELEVATOR.

The sum of \$8,400 was authorized last year for state aid maintenance of a road in Mercer Co., Pennsylvania, which was in very poor condition, the limestone surface having been entirely worn away and in places the telford badly damaged, in some instances being practically destroyed. The department proposed to put about 3,000 tons of limestone upon the road after repairing the telford foundation. The hauling of this stone was to be done by a state highway truck.

The assistant engineer in charge of the district, H. W. Claybaugh, realized that to keep the truck busy some kind of a loading device was necessary. The department had a crushing plant that was not in use. The elevators of this were taken off and a wooden frame was built; a pit 4 feet long, 4 feet wide and 4 feet 8 inches deep was dug under the track of the railroad siding and a hopper constructed. For 50 cents a day a 3-horsepower engine was rented, and with this outfit together with two men (one at \$2.50 and one at \$1.75 a day), gasoline and oil at 50 cents a day, the department was able to unload from 100 to 150 tons of stone a day at a total cost of \$5.25.

Considering delays, the unloading cost on the job never ran over 7 cents a ton, or about one-third of the cost if labor had been depended upon. The total cost of un-

loading was \$125. The five-ton truck was loaded in seven minutes from the time it was backed under the elevator until the time it was driven away. On some of the short hauls connected with this job, teams were used and here again the time saved was quite a factor, as a two-yard wagon was loaded in three minutes.

At a later date an additional amount of \$1,600 was received and this plant was continued in operation to the end of the season, unloading about 7,000 tons of material, with no repairs to speak of.

CALCULATING PREMIUMS ON BONDS

Determining Premium to be Paid by Purchaser to Yield Given Return on Investment—Given Premium, Find the Return.

We have so often been asked by municipal and road officials to explain how to calculate the effective interest yielded by bonds purchased at premium or discount that it seems probable that many of them would welcome an explanation of this. The question is perhaps most frequently suggested to them by reading such statements as: "Twenty-year 4 per cent bonds were sold to yield 3.70 per cent" or "on a 3.70 per cent basis." The following is an effort to explain this in its simplest form, covering only this phase of the subject:

Let g be the rate of dividends or interest paid.
Let i be the rate of interest yielded to the purchaser, or net income rate; i. e. the interest paid to him annually, divided by the amount he paid for the bonds, the interest referred to above as the "basis" or "sold to yield."

Let C be the price to be paid on redemption, or face value of the bond.

Let n be the life of the bond in years.

Let K be the present value of C , due n years hence at interest i .

Let A be the amount paid for or bid on the bonds.

Let a be the present value of an annuity of \$1 per year at i per cent to run for n years. (This is generally obtained from tables.)

The value of bonds to a purchaser consists of two parts: The annual interest or dividend to be received; and the sum he will receive in redemption of the bond at the end of n years.

A , the amount paid for the bond, is the present value of the sum of these two values. Without following through the demonstration, it can be shown that

$$A = K + \frac{g}{i}(C - K)$$

All of these are generally known except K , which can be calculated or obtained from tables. "Premium" is the amount by which the sum paid for a bond exceeds its face value. Calling this P ,

$$P = (g - i) C a$$

A few values for a are given herewith; tables can be obtained for all rates and periods of time.

Example: \$100,000 of 5% highway bonds, to run 30 years, interest payable annually are purchased to yield

3% on the investment. What amount is paid for them? Here $g = .05$; $i = .03$; $n = 30$; $C = 100,000$; $a = 19.6004414$. Then $P = (.05 - .03) 19.6004414 \times 100,000 = \$39,200.88$, the premium. Or the amount paid for the bonds was \$139,200.88.

Had n been 50 years, the premium would have been \$51,459.53.

Transposing the last equation, we find that

$$i = g - \frac{P}{C a}$$

But a depends upon i , which is not known. The calculation of i is so complicated that tables are generally used similar to that shown herewith.

The above is for interest payable annually, bonds all redeemable at one time. If interest is payable semi-annually, or the bonds are paid in installments, or "serial" bonds, the calculation is somewhat different, but the theory is the same. For the former case $\frac{1}{2} i$ is used instead of i , and $2n$ instead of n , in finding the value of a from the table, and the result P is divided by 2.

Bid on a Bond for \$100 to Realize a Given Net Income, 5 Per Cent Interest on Bond Payable Semi-Annually.

Net Income	5 Yrs.	10 Yrs.	15 Yrs.	20 Yrs.	25 Yrs.	30 Yrs.
3.00	109.22	117.17	124.02	129.92	135.00	139.38
3.10	108.74	116.23	122.65	128.16	132.89	136.93
3.20	108.26	115.30	121.31	126.44	130.81	134.55
3.30	107.78	114.38	119.99	124.75	128.79	132.22
3.40	107.30	113.47	118.68	123.08	126.80	129.94
3.50	106.83	112.56	117.39	121.45	124.86	127.72
3.60	106.35	111.67	116.12	119.84	122.95	125.55
3.70	105.88	110.78	114.86	118.26	121.08	123.44
3.80	105.42	109.91	113.62	116.70	119.26	121.37
3.90	104.95	109.04	112.40	115.18	117.47	119.35
4.00	104.49	108.18	111.20	113.68	115.71	117.38
4.10	104.03	107.32	110.01	112.20	113.99	115.45
4.20	103.57	106.48	108.84	110.75	112.31	113.57
4.30	103.12	105.64	107.68	109.33	110.66	111.74
4.40	102.67	104.81	106.54	107.93	109.04	109.94
4.50	102.22	103.99	105.41	106.55	107.46	108.19
4.60	101.77	103.18	104.30	105.19	105.91	106.47
4.70	101.32	102.37	103.20	103.86	104.38	104.80
4.80	100.88	101.57	102.12	102.55	102.89	103.16
4.90	100.44	100.78	101.05	101.27	101.43	101.56
5.00	100.00	100.00	100.00	100.00	100.00	100.00

REGULATING TRAFFIC.

An unusual illustration of the desirability of giving power to city officials to restrict traffic on certain streets is furnished in a recent report of Charles R. Case, superintendent of the department of streets and sewers of Seattle, Washington. In this report Mr. Case says "increased use of auto trucks with their heavy loads has destroyed many planked streets that were built several years ago of material too light to stand present traffic vehicles. We have protested vehemently against the use of streets like Fortieth avenue (which was planked with 3-inch lumber on top of stringers 3 feet apart several years ago in order that residents might reach their homes

Present Value of an Annuity of 1 for n Years at i Interest = a .

Years	2½%	2¾%	3%	3½%	4%	4½%	5%	Years
10	8.7520639	8.6400762	8.5302028	8.3166053	8.1108958	7.9127182	7.7217349	10
15	12.3813777	12.1566988	11.9379351	11.5174109	11.1183874	10.7395457	10.3796580	15
20	15.5891623	15.2272521	14.8774749	14.2124033	13.5903263	13.0079365	12.4622103	20
25	18.4243764	17.9083180	17.4131477	16.4815146	15.6220799	14.8282090	14.0939446	25
30	20.9302926	20.2493013	19.6004414	18.3920454	17.2920333	16.2888885	15.3724510	30
35	23.1451573	22.2933403	21.4872201	20.0006611	18.6646132	17.4610124	16.3741943	35
40	25.1027751	24.0781011	23.1147720	21.3550723	19.7927739	18.4015844	17.1590864	40
45	26.8330239	25.6364721	24.5187125	22.4954503	20.7200397	19.1563474	17.7740698	45
50	28.3623117	26.9971700	25.7297640	23.4556179	21.4821846	19.7620078	18.2559255	50

with necessary delivery of fuel and other supplies), by auto trucks with a load of twelve tons or more hauling over such routes and entirely destroying such streets. We have asked for the passage of an ordinance which would permit us to limit the load which would be permitted on such street, thereby affording some degree of protection of those for whom the street was improved as well as materially lessening the cost of maintenance. Such an ordinance was finally passed and will, we believe, materially aid us in better regulation of traffic and lessen the cost of maintenance."

PROPORTIONING CONCRETE

How Aberdeen Secures Use by Contractors of Proper Amounts of Cement and Aggregate—Proportions Used—Two-Course Work.

BY LOUIS D. KELSEY.*

The following article describes in a general way the method adopted by the city of Aberdeen, Washington, in the proportioning and checking of materials used in the construction of concrete pavements and concrete sidewalks.

In all the concrete pavements and sidewalks laid in this city, only screened sand and gravel have been used. This material is obtained from the bed of the Chehalis river, and the pit material is screened and washed before delivery to the scow.

Our pavements are all of two-course construction, consisting for the most part of a six-inch base and a two-inch top. The base contains enough water so that, when well tamped, the surface will flush and none of the mortar will be taken by it from the top course after it is placed. This base also makes a solid body upon which the workmen can walk in spreading the two-inch top, doing away with any chance of the workmen tramping holes in the base and allowing them to fill up with the surface mortar, thus insuring us a straight two-course pavement. The top course is mixed as a very soft mortar that is easily rodded to the shape of the crown desired.

In our lower course we call for one sack of cement (94 lbs.) to be used in each twelve square feet of six-inch base in place. This is based on one sack of cement to each six cubic feet of mixed concrete, sand and gravel to be proportioned as 3 to 5, or as directed. The "as directed" clause is placed in our specifications for the reason that our materials vary as to fineness, making it necessary to often shift our proportions of sand and gravel as they require.

In our two-inch top course we call for one sack of cement in every 14½ square feet of two-inch top in place, aggregate mixed one sand to two pea gravel, or as directed.

The inspector can, by checking the sub-grade and keeping the base and top to the required thickness at the time they are placed, compute the amount of cement used against the amount required under the specifications. On the work where a boom mixer is used, the inspector takes a check on each move of the mixer, which is about every twenty feet.

In our concrete sidewalk construction we call for one sack of cement to be used in each twenty-four square feet of 3½-inch concrete base in place, aggregate proportioned one sand to two gravel, or as directed. This is based on one sack of cement to each seven cubic feet of mixed concrete. In place of calling for a straight proportion on the one-half inch top for sidewalk work, that is, one cement to two sand, we limit the contractor

to one sack of cement (94 pounds) to be used in each 15½ square feet of sidewalk in place, top and bottom included; the top to be composed of sand and cement in such proportions as will not exceed the limit as set in the specifications for the distance that one sack of cement will run. For the most of the sands which we have used, we have found that this is very close to a 1 to 2 proportion.

This system of specifying how far a sack of cement shall run in concrete pavement and sidewalk construction, we have found, has some good advantages from an engineering point of view.

First: We have found that we can handle a job with only one inspector, whereas in many cities using the other method of mixing—that is, straight proportions—they are using two inspectors, one at the mixer and one at the grade where the concrete is being placed.

Second: From this method of specifying, the contractors, in making up their bids, can compute the amount of cement that is actually required on any certain piece of work, and it also guards against the contractor shaving his price at the time of letting the contract on the theory that he can run a leaner mixture than is called for.

Third: The inspector on the work, after once adjusting the proportions of sand and gravel desired, has as his duty the watching of the cement, the empty cement sacks, the sub-grade and the placing of the concrete, and by measuring up the base at intervals, can at once detect any change in the proportions of sand and gravel.

During the last two years we have placed some 26,000 square yards of two-course concrete pavement and 17,000 square yards of concrete sidewalks under this type of specification, and we find that this method is giving us good satisfaction.

ROAD WORK IN DELAWARE.

In his report for the years 1913 and 1914 concerning road work in Newcastle county, Delaware, James Wilson, state highway commissioner for that county, gives the following information concerning road maintenance:

"Realizing the urgent necessity of a maintenance fund for the upkeep of our new improved roads, the Levy Court for the last three years has set aside annually a sum equal to at least \$300 per mile of improved road. The present court has not only set aside \$50,000 for each of the fiscal years 1913 and 1914, making \$100,000 in two years, but in addition thereto placed \$10,000 at the disposal of the county engineer to use in applying some bituminous surface treatment for the better preservation and more economical maintenance of certain of our new roads. After considerable investigation in other localities where bituminous materials have been used, it was decided to apply Ugite, a gas tar, on some roads and Trinidad natural asphalt road oil on others. Some twenty miles were surfaced with the former at the rate of one-third gallon per square yard and fifteen pounds of stone chips; and about ten miles of the latter at the rate of one-half gallon per square yard and forty pounds of stone chips.

"The court also recognized that for the proper application of the above funds, it was necessary to adopt some more efficient system of maintenance than heretofore, and decided to initiate a continuous maintenance system, similar to the patrol system successfully used in Europe and some few of our states. We have not as yet been able to fully put into effect the single patrol system, even where desirable, for lack of proper labor, so have used the gang system in many stretches of road, but hope gradually to organize and equip a good working road corps of patrolmen. The effect so far has been

*City engineer of Aberdeen, Washington.

encouraging, and our roads are generally getting back into better condition.

"For several years past we have frequently used the short term prisoners from the county workhouse on road work, both in construction and maintenance; but since the last general assembly passed a law enabling the workhouse trustees to contract with the county authorities to work the convicts on the public roads, we have built two short sections of waterbound macadam, one of 0.67 mile in length and the other of 0.51 mile. The work has been very satisfactory. We have lately entered into an agreement with the workhouse authorities to take over and keep in maintenance and repair several stretches of road within a three or more mile radius from the prison. We hope this arrangement will prove successful and satisfactory to both bodies, so that it may be enlarged upon in the future."

Most of the roads built during the past two years have had a width of paved roadway of either 12 or 14 feet, the majority the former. Trap rock was used for most of these, but limestone and native stone were used for a few of them. The cost per mile of 12-foot road varied from \$6,335.45 to \$21,371.89.

BRICK PAVEMENT DETAILS.

The subject of brick pavements, with special reference to those laid in Ohio, was treated of by John Laylin, division engineer of the Ohio Highway Department, in a paper before the American Road Builders' Association. He described the standard method of building brick pavements (practically that recommended by the National Paving Brick Manufacturers Association) and in conclusion described briefly a few details of certain roads in his state. A stretch of the Cleveland-Buffalo highway in Lake County, $2\frac{1}{2}$ miles long, has a brick surface 18 feet wide curbed on each side, and with a 24-inch concrete gutter having a $2\frac{1}{2}$ -inch concave surface. These gutters collect the water from both the pavement and the lawns and conduct this to catch basins connected with a system of

underground drains. The lawns slope back from the gutters and the park-like effect is very pleasing.

Two streets in Norwalk, Ohio, have been laid on natural bed foundations and edged with vitrified curbs. These curbs were made on a regular paving brick machine with three out of four of the cutting wires removed, thus making a block that when burned was $4 \times 8\frac{1}{2} \times 15\frac{1}{2}$ inches. These blocks were set with the $8\frac{1}{2}$ -inch dimension vertical and bedded in gravel or crushed limestone. Portland cement filler was used in the pavement. The work has been in place less than two years, but looks like good cheap pavement construction. He recommends concrete foundation, however, where traffic is heavy.

VISUALIZING GRADE CROSSING PROJECTS.

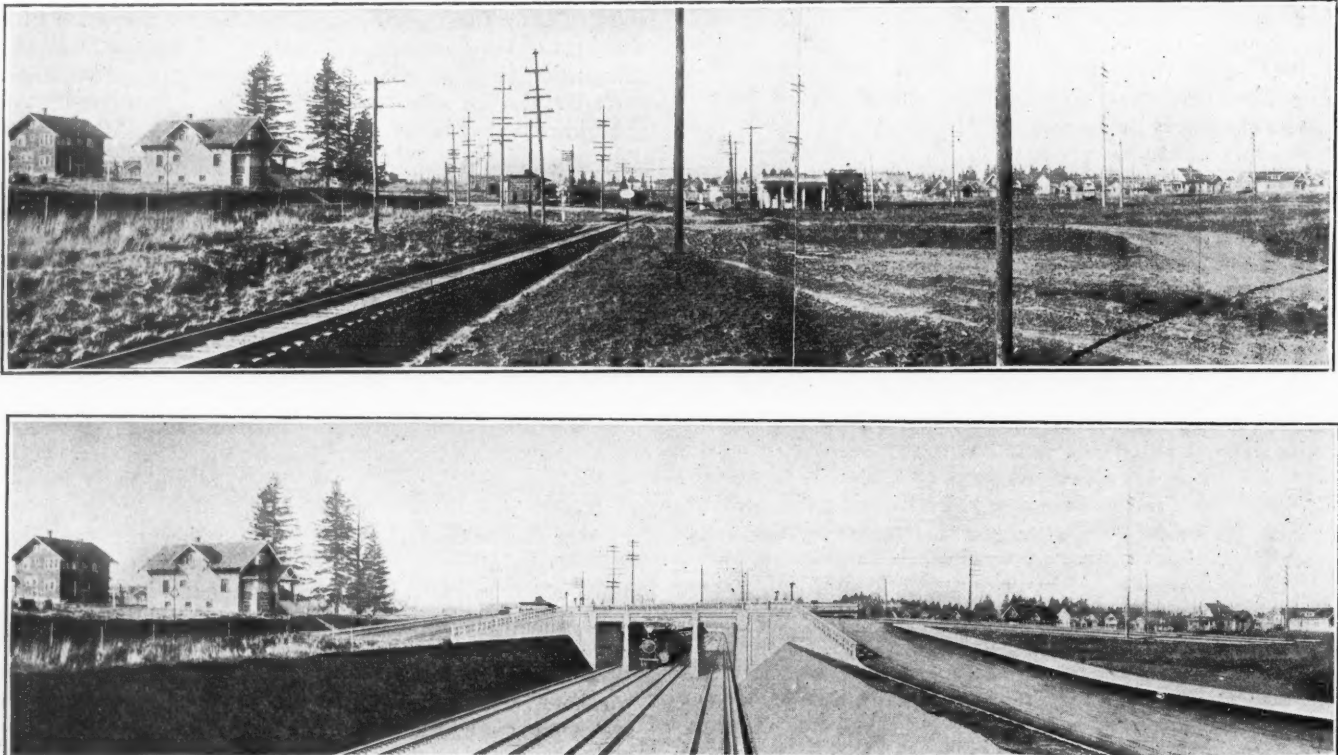
BY H. W. WHITE.

Visualization of proposed engineering projects has been adopted by the Department of Public Works of Portland, Oregon, as a means of showing property owners and taxpayers the exact effect of proposed bridge and other structures. Photographs are taken of the site and the structure is drawn in to exact scale, giving the property owner an idea of how the finished structure will appear which the average citizen could not obtain from drawings.

The accompanying photographs show a grade crossing over the main line of the Oregon-Washington Railroad & Navigation Company, in East Portland, as it appears at present and as it will appear when a viaduct project proposed by the city is completed. The viaduct as shown in the visualization is drawn to scale in every respect.

The project, which includes the elimination also of seven other grade crossings in the vicinity of the one shown, involves an expenditure of about \$750,000. By means of the visualization the Department of Public Works has won over many property owners who formerly were opposed to the project.

This plan of informing citizens of the nature of proposed work was formulated by H. W. Holmes, an engineer in the Department of Public Works, and is to be

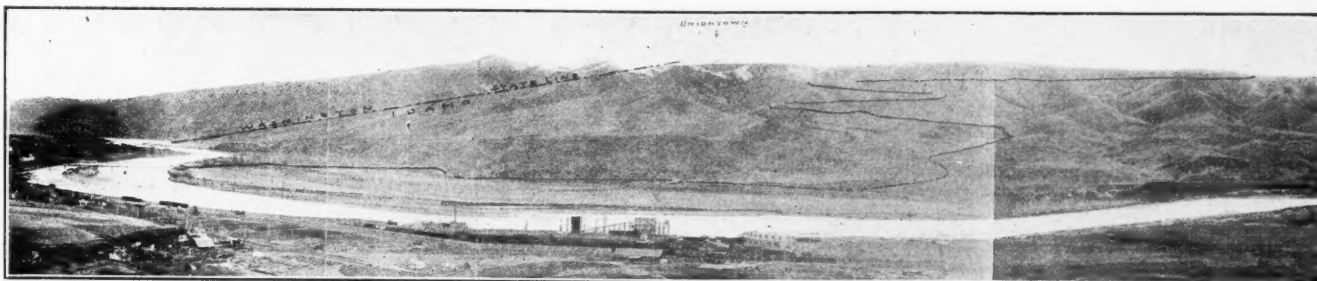


PHOTOGRAPH OF PRESENT CONDITIONS; AND THE SAME CHANGED TO SHOW PROPOSED WORK.
A Faint Black Line on the Upper Photograph Shows the Proposed Grade of Street.

used in all bridge and viaduct projects in Portland in the future.

[Another method of putting an engineer's plan in a pictured form to be understood by a layman is illustrated by the photograph, on which is drawn the proposed route of a part of the Idaho-Pacific Highway, developed to give a 5 per cent maximum grade. (This

is reduced from a print in the annual report of the Idaho State Highway Commission, and unfortunately did not reproduce very well.) Almost anyone familiar with the ground, even the engineers themselves, can obtain a better idea of certain features of a location from such a photograph than from a plan, even if on a topographical map.—Editor.]



LOCATION OF IDAHO-PACIFIC HIGHWAY SHOWN ON PHOTOGRAPH OF UNIONTOWN HILL.

NOTES FROM STATE HIGHWAY DEPARTMENTS

Information Contributed by Officials Concerning Road Work Done and in Prospect, Additional to That Given in the Tables—State Highway Legislation During the Past Year
—Highway Work Contemplated in 1915.

The following information has been received from the state highway commissioners, engineers or other officials of the state departments in addition to that given in the tables in this issue. We have arranged it alphabetically by state names. These and the items in the tables should be considered as supplementary to each other. Where it seemed practicable, the information is given in the words used by the officials in their letters.

Alabama—The mileage and expenditures on state aid roads is kept in this office; the mileage and expenditures on the roads in the counties at large is sent us by authorities in the counties and is as nearly correct as can be obtained. Expenditures of the counties for 1914 were \$1,878,170. The counties constructed 9,450 lineal feet of steel bridge and 2,706 lineal feet of concrete bridge. Expenditures on bridges by counties amounted to \$499,874.50. This information covers all but nine counties of the state, which have not yet reported to us.

There is available from the state this year approximately \$200,000. To get this amount from the state, the counties are required to put up a like amount; so there will be available under the direction of the state highway department approximately \$400,000 for the year 1915. I am unable to give you the character and types of road that will be constructed, as this is not decided until the counties make application. The counties, independently of the state, will spend during the year 1915 approximately \$2,500,000 on roads and bridges.

No legislation was passed last year but there are several bills now pending. One of them is to give the highway department the automobile fund to be used on roads. Another bill continues the present appropriation of \$2,000 each year to each county but requires that this money be spent on a road in the county designated as a state trunk road.

Arkansas—This state directly builds no highways; it does, however, render state aid in the form of engineering services and crushed rock at the cost of production. The permanent highway work is done under the "improvement district" plan. During the year 1914, 127 miles of water-bound macadam was constructed at a cost of \$635,000; 83 miles of gravel at a cost of \$300,000; 27 miles of concrete at a cost of \$229,500; a total of 237 miles at a cost of \$1,164,500.

During the year 1915 we expect to construct 32 miles of bituminous top on concrete base, estimated to cost \$320,000; 28½ miles of concrete, estimated to cost \$242,250; 284 miles of water-bound macadam, estimated to cost \$1,562,000; 105 miles of gravel, estimated to cost \$420,000; a total of 449½ miles at an estimated cost of \$2,544,250.

The principal legislation enacted during the last session of our legislature was the passage of the general "improvement district" law, which will permit the formation of improvement districts in any part of the state. We have heretofore been operating under a series of special acts pertaining to a few counties.

Connecticut—We have no means of telling at this time the amount of various kinds of construction which will be laid in this state during the balance of the fiscal year, which will end October 1, 1915. Exclusive of contracts already let, there is a balance available for road work for the period ending October 1, 1915, of approximately \$900,000. There was no legislation during the year 1914.

Georgia—The State Geological Survey, in co-operation with the U. S. Office of Public Roads, is now collecting data on the highways of the state, but this information will not be available for some months yet. The legislature enacted no laws in regard to highways in 1914.

Idaho—The figures given refer to work done by the state highway commission and do not include work done independently by the counties. It has been estimated that the counties and highway districts of the state expend about one million dollars annually for county roads and bridges.

Quite a number of changes were made by the 1915 legislature in the highway law of the state. The motor vehicle license tax was formerly collected by the secretary of the state; it is now to be collected by the county assessors, and 75 per cent is to be retained by the counties to pay the interest on any outstanding road and bridge bonds and for general road and bridge expenditures. The old law provided for the entire amount to go into the state highway fund, except that a county having a road bond issue was entitled to a rebate of 70 per cent of the amount contributed. (The highway law goes unusually, and it appears to us unnecessarily, into details which might better be left to the department; one of

these, for instance, being to designate the words to be used on signs erected along the state roads, the size of sign, size of letter and color of letter and background.)

Iowa—Iowa has no provision—state aid, county or district bonding provision—for building hard surface roads. Two miles of concrete road were built during the past season by counties that required road funds aided by voluntary contributions. One mile of high grade waterbound macadam road was built and possibly half a dozen miles of more cheaply constructed macadam. It is estimated that there were 1,500 miles which received a thin gravel coating which was packed down by travel.

The total money which came into the hands of county and township officials for expenditure on roads and bridges was \$11,000,000. The state auditor has just estimated that there will be approximately \$10,700,000 available for township and road officials from regular tax levies in 1915. The automobile tax money should net something over a million dollars this year; 85 per cent of which goes back to the counties and will add so much to amount expended by county officials. Expense of highway commission is paid from 8 per cent of the auto tax.

The Iowa legislators have refused to grant state aid for hard surfacing and have so far declined to provide any bonding plan by which counties or districts can issue bonds for hard surfacing. There has been practically no such work done in the state. The total mileage of concrete on country roads in the state is not over seven miles, and this is in short stretches of half a mile or so. The longest stretch was put down largely by contributed money this year, and was 1.37 miles long.

Kansas—The state does not appropriate any money for road improvements and cannot until the constitution is amended. Since all of the work is done by the counties and townships and a large part of it is for bridges and earth road grading and maintenance, I am able to give you only the figures which we have. The expenditures for 1914 for highway improvement were \$5,427,424. The expenditures for 1915 will be at least \$5,500,000. The average expenditure for the last three years for public highways in Kansas was \$44.76 per mile.

Kentucky—Amount of highways constructed during 1914 (new road), 10 miles. Amount of highways improved during 1914 (new road), 300 miles, consisting of 50 miles of macadam, 65 of gravel and 185 of earth graded and drained.

All work in 1914 was done by counties. Five hundred miles will be constructed by state aid in 1915, 200 of earth, 150 of gravel, 100 macadam and 50 bituminous surface.

In 1914 about \$1,700,000 was expended by the counties. For 1915 state aid makes available an additional \$1,200,000 (\$600,000 from the state treasury and a like amount from the counties).

In 1914 the general assembly extended the duties, powers and organization of the department; passed the state aid law and levied a tax of 5 cents on \$100 of taxable wealth in the state; these funds to be redistributed to the counties applying, the county being required to put up an amount equal to that requested from the state. No one county may receive more than 2 per cent of the total state road fund.

Maine—Of 131 miles of state highway (the entire cost of which is borne by the state) under construction in 1914, 80 miles remains to be completed this year. Besides completing this mileage, there will be completed from this year's bond funds between 50 and 60 miles of new state highway. One hundred and forty-two miles of state aid road was built last year in about 500 towns at a total cost of approximately \$600,000. It is estimated that an equal mileage will be constructed the present year.

There was practically no new construction by the various towns last year. About \$1,400,000 was expended in ordinary road maintenance.

Last year was the first year in which systematic maintenance of state and state aid highway was undertaken. There was expended on 760 miles of road, principally all gravel and graded state roads, \$100,000, of which the state furnished about \$70,000; but this year there will be substantially 900 miles of state aid highway to maintain, and by the first of July we shall have 130 miles of state highway under maintenance. This will all be done by the patrol system. We estimate that the expenditures for 1915 for maintenance will be a little larger than they were in 1914.

There was no legislation during 1914 modifying the organization, power or duties of the state highway department.

Massachusetts—We laid out about 59 miles of state highway during the year and completed over 76 miles that we laid out in 1913-'14. Of the state highways constructed in 1914, over 35 miles were bituminous macadam; 5 miles waterbound macadam (which will be covered with bituminous binder), 3 miles gravel, 5½ miles sand and asphaltic oil, 4 miles macadam covered with a heavy asphaltic oil, 2¼ miles of concrete, 3 1/5 miles of bituminous gravel, 2½ miles of sand and clay, and over 15 miles of graded road to be surfaced later.

We have constructed in all under the "small town" act over 430 miles, and with money available from the motor vehicle fees for use in towns, nearly 160 miles or road have been constructed and improved, and from special appropriation over 38 miles have been constructed.

We have had during the last year available for construction \$1,000,000 for state highways and "small town" roads. There was appropriated \$350,000 from the state tax for the maintenance of state highways, and \$647,000 was available from net motor vehicle fees, making a total of \$997,000 available for the maintenance of state highways. There was \$162,000 available for through roads in the towns from the motor vehicle fees. The municipalities contributed \$136,000 in connection with this work.

For 1915 the state highway department has available from the loan fund for state highway work and "small town" work \$1,000,000; also it has available for work in the towns under the motor vehicle fees act about \$150,000, and \$17,000 for the maintenance of bridges; for the repair and maintenance of state highways from the tax levy, probably \$350,000 would be available, and from the motor vehicle fee fund about \$600,000 will probably be available for the maintenance of state highways. We have also available from certain special acts of the legislature requiring the construction of particular roads, something over \$200,000; making a total to be expended by this department of \$2,317,000.

The state highway commission expended in 1914 for new construction, including state highways and "small town" work and the work done with money obtainable from the motor vehicle fees, \$1,227,980. We had available for construction under special acts of the legislature, \$261,567, and for one investigation about \$40, making a total of \$1,489,583 expended for construction.

Very likely there will be a commission appointed to codify and redraft the highway laws of the commonwealth with a view to equalizing the expenditures and centralizing the authority between the state, the counties and the municipalities.

Nevada—This office (of state engineer) has no data pertaining to road work in this state.

New Mexico—Money used for road purposes in New Mexico may be divided into two class: That paid into the state treasury, and that raised by the counties. The for-

mer comprises (1) a 1-mill levy on assessed valuation; (2) automobile licenses; (3) one-half the amount paid by national forest reserves to Grant and Socorro counties; (4) state highway bonds. The second class consists of (1) levy (not to exceed 3 mills) for road and bridge purposes; (2) levy (not to exceed 5 mills) for certain specified roads, spent under supervision of State Highway Commission; (3) levy for building designated bridges, spent by county commissioners after plans approved by state commission; (4) proportionate amount of forest reserve income; (5) \$3 road tax, payable in money or labor; (6) county road bonds. The amount available for 1915 from the first class is \$110,019; from the second class, \$436,000. Of this, \$57,815 must be paid for previous contracts, leaving \$488,185 total available.

There is no change in the road laws from last year.

North Carolina—A law providing for the establishment of a state highway commission was passed by the recent legislature and the governor has named the members of the commission. The bill provides for the establishment of a state highway commission consisting of the governor, three citizens of the state appointed by him, the state geologist, a professor of civil engineering from the University of North Carolina and a professor of civil engineering from the North Carolina Agricultural and Mechanical College, these two professors to be selected by the governor. Heretofore the state geologist, Joseph Hyde Pratt (who thus becomes a member of the commission), performed the duties of collecting information concerning roads in the state. The commission as appointed consists of Profs. M. H. Stacy, University of North Carolina, and W. C. Riddick, of North Carolina Agricultural and Mechanical College; E. C. Duncan, Col. Benehan Cameron and Guy V. Roberts, together with Mr. Pratt and Governor Craig.

State Geologist Pratt has estimated that the funds available for road-building in 1915 would comprise two million dollars by special tax, three million dollars by bond issues, \$400,000 worth of convict labor, \$800,000 of free labor and \$50,000 by private subscription; a total of \$6,250,000. Whether this estimate will be modified by the recent legislation we cannot say.

Oregon—The year 1914 was the first of the state highway commission, and it was entrusted by the counties with the expenditure of \$1,735,000 on road improvement. A system of state or trunk roads has been adopted and a start made toward the construction of them. The law provides for a $\frac{3}{4}$ -mill levy, which yields about \$240,000 annually and \$10,000 is appropriated by the state for the salary of the state highway engineer and expenses of his office.

There were in this state on November 30, 1914, 37,639 miles of public road, of which 962 were macadam, 3,745 gravel, 232 plank, 25 hard surface pavement and 32,689 were earth. The total amount spent on roads and bridges (1903 to 1914) has been \$21,972,121. The several counties own 44 rock quarries, 92 rock crushers, 66 gravel pits, 35 steam road rollers, 17 gasoline road rollers, 27 steam road engines, 3 gasoline road engines, 47 cars used as trailers and 459 road drags.

South Carolina—During the past year possibly 20 or 30 miles of natural cement gravel surface road was built on the Charleston-Summerville automobile highway. Throughout the state possibly 500 miles of new and broad sand-clay roads were constructed in several counties, there having been a marked improvement in the matter of construction, particularly with regard to drainage and the broadening of existing highways.

The principal event of the year was the building of some 30 miles of entirely new road from McBee to Cheraw on the government maintained Washington-to-At-

lanta highway. This road was cut through a virgin country and reduces the distance from north to south some 20 miles. The engineering work was done by the United States office of public roads and the engineer from that office has supervision of the maintenance. The claying of that road is just now beginning.

Altogether something over a million dollars was spent on road-building, improvements and maintenance during the past year. We have not yet obtained a state highway commission, but will likely get provision made therefor at the next session of the general assembly. At the 1914 session of the general assembly, however, a bond issue of one million and a quarter dollars was authorized for the construction of paved permanent highways in the county of Richland; an issue of \$960,000 for the same purpose was authorized in the county of Greenville, and elections were ordered on bond issues for the same purpose in Anderson county for \$750,000, in Union county for \$300,000 and in Chesterfield county for \$220,000.

South Dakota—The amount of highways constructed during the year 1914 by the state directly was about 35 miles, which was entirely through or abutting on state school and endowment land, over the construction of which the state engineer has direct supervision. There were no roads constructed by state aid.

A bill was introduced into the legislature appropriating \$25,000 for the two succeeding years to provide for salaries for the three members of the commission and a state highway engineer, but this bill failed to pass either house, and the state engineer will continue to act in the capacity of state highway engineer when his services are so needed, and the three members of the state highway commission will be required to serve without compensation or any allowances for expense.

Virginia—Appropriations for road work for 1915 are as follows: State money aid, \$185,000; automobile taxes, approximately \$135,000; convict road force, \$200,000. The total amount available for road work will be about \$2,000,000. There are no highways constructed by the state directly.

During the year ending December 30, 1914, 152 miles of macadam were built at an average cost per mile of \$4,334, 85 miles by money aid and 67 by convict labor. In addition, 46 $\frac{1}{2}$ miles were completed which were reported in 1913 as having been graded; 103.6 miles of gravel roads were constructed, 64.1 miles of this were by money aid and cost an average of \$2,010 per mile, while 39.5 miles were by convict labor and cost an average of \$1,889 per mile. Of sand clay roads, 300.6 miles were built with money aid at an average cost of \$837.19 per mile and 128.4 miles were built by convict labor at a cost of \$1,154 per mile. Soil roads with stone base built with money aid total 1.07 miles, averaging \$4,549.53 per mile, and 4.13 miles of the same kind of road by convict labor averaged \$3,137.83 per mile. Of shale roads 3.44 miles were built by convict labor at an average cost of \$3,399.80. One hundred and one miles were graded by money aid at an average cost of \$2,204.05 and 2.85 miles by convict labor at an average cost of \$1,117.83. Of shell roads, 2.66 miles were built by money aid, averaging \$4,088.75 per mile; 0.84 of a mile of concrete was built by money aid at an average cost of \$14,117.54 per mile and 7.68 were built of bituminous macadam, costing an average of \$10,005.69 per mile.

Washington—To date there has been very little hard surfacing done on state roads; but the department has done everything it possibly could to improve those portions of the state roads that will be used by the interstate traffic that is expected on account of the western tourist interest and the California fairs. A great deal of work was done during the season of 1914 with this end in view.

DATA CONCERNING HIGHWAY CONSTRUCTION

Road Work Done, by States, Counties and Towns Previous to and During 1914—Expenditures During 1914

—Amounts Available for Work in 1915.

The following tables present the latest data concerning highways which we have been able to obtain from any source. Table No. 1 and columns 1, 6, 7, 8 and 9 of Table No. 3 were obtained from the Office of Public Roads of

the U. S. Department of Agriculture. The remaining figures, together with the further information given on pages 429, 430 and 431, were sent at our request through the courtesy of the highway officials of the several states

TABLE NO. 1—ROADS BUILT TO JANUARY 1, 1914, BY COUNTIES, DISTRICTS OR TOWNSHIPS.

	County and District Roads					Township Roads					
	Earth or sand-clay.	Gravel or macadam.	Bituminous macadam.	Concrete.	Brick.	Total.	Earth or sand-clay.	Gravel or macadam.	Bitumin's macadam.	Brick.	Total.
Alabama	642.5	534.5	1	...	...	1,178.0	...	...	...	...	...
Arizona	...	200.0	...	...	...	200.0	...	...	...	...	...
Arkansas	23.0	6.	...	...	...	29.0	...	...	...	...	...
California	162.0	855.5	459.	44.	...	1,520.5	...	...	...	...	...
Delaware	60.0	164.6	2.0	...	...	226.6	...	...	...	...	...
Florida	116.0	119.0	32.a	...	135	402.0	...	...	...	...	...
Georgia	125.0	...	...	...	...	125.0	...	...	...	...	...
Idaho	...	60.0	...	...	...	60.0	...	...	...	...	...
Illinois	...	...	...	...	...	...	...	27.0	...	...	27.0
Indiana	...	1,298.8	13.0	...	1.2	1,113.6	...	1,038.6	...	...	1,038.6
Kansas	...	13.0	...	...	...	13.0	...	...	...	...	...
Kentucky	...	15.0	...	...	...	15.0	...	...	...	...	...
Louisiana	71.0	71.5	...	...	...	142.5	...	...	...	...	...
Maryland	...	13.0	14.	...	...	27.0	...	...	...	...	...
Massachusetts	...	...	...	...	...	...	...	2.5	...	...	2.5
Michigan	23.5	412.0	...	80.0	...	515.5	8	56.6	...	2.25	66.8
Minnesota	20.0	175.0	...	...	...	195.0	59	7.	...	...	66.0
Mississippi	432.2	104.8	25a	...	...	562.0	...	...	...	...	...
Missouri	...	114.0	...	...	...	114.0	...	...	...	...	...
Montana	...	60.0	...	...	...	60.0	...	...	...	...	...
Nevada	22.0	7.0	...	...	...	29.0	...	...	...	...	...
New Jersey	...	295.4	...	13.0	...	308.4	...	6.	...	...	6.
New Mexico	...	40.0	...	...	...	40.0	...	...	...	...	...
New York	...	124.0	...	...	...	124.0	...	43.	15.	...	58.
North Carolina	519.0	598.0	6.0	...	...	1,123.0	...	...	...	...	...
Ohio	...	1,462.1	31.0	14.8	45.9	1,553.8	59.	223	...	23.8	395.8
Oregon	...	...	52.0	...	...	52.0	...	...	...	...	...
Pennsylvania	22.b	614.8	134.1	0.6	74.9	846.4	4	13.5	...	...	17.5
So. Carolina	70.0	...	...	...	...	70.0	...	...	...	...	...
Tennessee	...	392.0	...	...	...	392.0	...	...	...	...	...
Texas	929.5	1,128.5	60.0	...	...	2,118.0	...	...	...	...	...
Virginia	137.8	438.5	...	...	...	576.3	...	...	...	...	...
W. Virginia	...	...	...	...	41c	...	...	...	...	...	...
Wisconsin	43.2	9.6	...	...	...	52.8	...	14	...	...	14.0

a—shell roads; b—plank roads; c—concrete and brick.

TABLE NO. 2—ROADS IN USE IN VARIOUS STATES.

State.	Total miles in use in state.	Miles of Improved Roads in State.							Unknown or other kinds.
		Earth.	Sand-clay.	Gravel.	Water-bound macadam.	Bitum. macadam.	Bitum. concrete.	Cement concrete.	
Alabama	49,639	585	460	220	178				4,734 d
Arizona	5,987	220							
Arkansas	36,445								
California	48,069								9,207 d
Colorado	30,733	5,014 a							
Connecticut	12,583								3,497 d
Delaware c	3,000				220				
Florida	17,954								
Georgia	83,986								
Idaho	18,403	525			63				
Illinois	94,141		9 f	5,000	4,096	51		58	50
Indiana	63,370								
Iowa	102,427				500			3	
Kansas	98,302								
Kentucky	53,744								10,500 d
Louisiana	24,962								723 d
Maine	25,528	60		135	41	27		22	3,120
Maryland	17,025								3,624 d
Massachusetts	17,272	110.5	2.5	417.5	203.5	928.5	5.8	9.6	7,774
Michigan	102,427		52	1,670	647			67	6,943
Minnesota	91,890								9,934 d
Mississippi	44,803		1,385.2	810.8	115				150
Missouri h	117,634		570	3,420	1,517	650			342
Montana	70,000								
Nebraska	80,388								
Nevada	12,751								
New Hampshire	15,116	81		623	169				3,821
New Jersey	14,842								705 h
New Mexico	16,920			56					
New York	79,279			156	2,161	1,531	9	267	14,618
North Carolina	48,285	500	700	65	50				3,440
North Dakota	61,593								
Ohio	88,861			5.6	439.5	40.4	5.4	28.3	160.4
Oklahoma h	79,883	499							24,095
Oregon	37,639			3,745	962				257
Pennsylvania g	87,387				297	160.8	90.4	3.2	82.0
Rhode Island h	2,121				256	92			898
South Carolina	45,549		5,019	300	58				1,035
South Dakota h	56,354								4,000 d
Tennessee	45,913								
Texas	128,971								
Utah	8,320								3,303 d
Vermont	15,000								3,836
Virginia	43,399	437.66 b	2.66 c	103.60	198.45	7.68		.84	
Washington	39,051								
West Virginia	32,109			204	453			36	11,180
Wisconsin h	61,090	683							
Wyoming h	10,569		1,000	1,000					

a—includes earth, sand-clay and gravel roads; b—includes earth, sand-clay and shale; c—shell; d—total, different kinds not given; e—covers only New Castle County; f—oiled macadam; g—June, 1913, to June 1914; h—to Jan. 1, 1914.

TABLE NO. 3—BONDS VOTED, AMOUNTS SPENT AND MILEAGE CONSTRUCTED BY THE SEVERAL STATES.

State.	1 State bonds voted to Jan. 1, 1914.	2 Total amount of state and county funds to be spent in 1915.	3 Amount spent in 1914 by state or under state su- pervision.	4 Miles of road built in 1914 by state or state aid.	5 Total miles of improved road to Jan. 1, 1915.	6 County and District Bonds voted to Jan. 1, 1914.	7 Miles of road built to Jan. 1, 1914.	8 Township Bonds voted to Jan. 1, 1914.	9 Miles of road built to Jan. 1, 1914.
Alabama		\$2,250,000		171.54	5,663	\$5,121,500	1,178		
Arizona						808,000	200		
Arkansas		5,000,000				1,218,315	29		
California	\$18,000,000			419	9,207	15,630,800	1,520.5		
Colorado		1,600,000	964,077	380.4	5,014	134,700			
Connecticut	10,500,000		4,805,825 e	397.9 e	3,497.9			\$576,500	
Delaware			556,123	39.9 d	260	1,395,000	226.6		
Florida		5,000,000 c	No highway dept.			7,285,000	402		
Georgia			No highway dept.			1,176,000	125		
Idaho	505,000	1,300,000	105,600	525		1,221,837	60		
Illinois		3,000,000		90	9,352	420,320		1,618,634	27
Indiana			No highway dept.			18,072,049	1,113.6	35,837,348	1,038.6
Iowa			See letter			4,006,314			
Kansas		See letter				1,132,375	13	677,065	
Kentucky		1,700,000			10,500 f	1,759,872	15		
Louisiana		600,000	319,950	132.7	723	1,932,840	142.5		
Maine	2,000,000	1,100,000	1,400,000	192	3,405			78,000	
Maryland	9,170,000		3,000,000 f		3,624 j	750,500	27		
Massachusetts	14,365,000	2,317,000	1,489,583	704	9,452	813,000		650,473	2.5
Michigan			3,809,793	682.3	9,380	6,382,152	515.5	1,926,135	66.8
Minnesota		2,614,606	3,809,793		9,934	1,388,350	195	982,805	66
Mississippi			No highway dept.		2,468 j	8,710,872	562		
Missouri					5,499 j	1,721,500	114	65,000	
Montana						2,239,606	60		
Nebraska						553,500		246,170	
Nevada						175,000	29		
New Hampshire	1,300,000	650,000	550,000	151.6				40,000	
New Jersey		1,250,000		149	3,821	14,386,782	308.4	760,600	6
New Mexico	500,000	488,185	277,322		761 j	246,500	40		
New York	100,000,000		19,647,417	863.1	18,907	9,097,923	124	2,631,165	58
North Carolina		6,250,000 c	Dept. just formed.		4,755	5,541,273	1,123	2,751,300	
North Dakota						63,000			
Ohio			1,700,000	140	24,831	35,241,828	1,553.8	5,283,805	305.8
Oklahoma			188,975		499 j	1,440,000		382,288	
Oregon		300,000	4,708,652 b	568.6 a	4,296 j	2,150,000	52		
Pennsylvania						24,839,050	846.4	2,333,609	17.5
Rhode Island	1,800,000				1,246 j			265,000	
South Carolina			No highway dept.		6,412	410,000	70		
South Dakota		1,229,000		35		77,300		3,500	
Tennessee			No highway dept.			12,674,298	392		
Texas			No highway dept.			24,960,837	2,118		
Utah	260,000					440,500			
Vermont					3,303 j			17,321	
Virginia		2,000,000	1,767,010	854.67 g	4,587	6,632,400	576.3		
Washington	190,000					4,408,262			
West Virginia					12,556 j	2,500,000	41.0		
Wisconsin		3,618,663				244,000	52.8	27,000	14
Wyoming		375,000 c							
Total	158,590,000					229,403,355	13,825.4	57,153,718	

a—June, 1911, to June, 1914; b—June, 1913, to June, 1914; c—by counties only; d—June, 1913, to January, 1915; e—February 26, 1913, to September 30, 1914; f—approximate; g—year ends September 30; h—April 7, 1913, to November 30, 1914; i—New Castle County only; j—to January 1, 1914.

(all of the information having been received within the past week and being, therefore, the very latest obtainable); those in Table No. 2 being obtained in many cases by adding the work reported done in 1914 to our records of total mileage as given in Municipal Journal last year.

As explained on page 435, the figures obtained from the Office of Public Roads are confessedly incomplete; and those secured directly by us are far from telling the whole story. A number of state highway officials report

that they have no data as to total mileage in their states, nor even the amount of work done in 1914. One writes, "The * * * Highway Commission * * * has never held a meeting. There is no State Highway Department and the information for which you ask has not been collected." Under these conditions it was impossible to secure complete data for all the states. But those for state or state-aid construction are, we believe, complete and accurate.

CONCRETE ROAD CONSTRUCTION.

In a paper on concrete roads, read before the American Road Builders' Association, H. J. Kuelling, county highway commissioner of Milwaukee County, Wisconsin, discussed the foundation, width, thickness, ingredients and other features of such roads. Sufficient study has not, in his opinion, been made of the proportions to be given to the mixture. The aggregate to be used in each case should be studied and those proportions adopted which will give the greatest density obtainable; hydrated lime or some other inactive material being added if necessary to assist in obtaining this result. Almost, if not quite, as important is uniformity of mixing. This is determined to a considerable degree by the amount of mixing and also by the kind of mixing machinery employed. The latter point he thinks is commonly overlooked, but he believes that five turns with some mixers is as good as ten turns with others. The amount of mixing necessary also de-

pends upon the shape of the individual pieces in the aggregate. In each case the number of turns of the mixer which should be required should be learned by carefully examining the output; attention being paid to the speed of the drum as well as number of revolutions.

Curing is very important, and the first step in this is to see that the subgrade is damp, sprinkling it in dry weather. The next step is to protect the road with canvas in case the temperature is over 90 degrees or the weather is dry and windy. As soon as it is sufficiently hard, the concrete should be sprinkled and covered with about 2 inches of earth taken from the side of the road and this should be kept wet (not moist) for about ten days.

The question of joints he believes to be the most unsettled one in connection with concrete roads. In Milwaukee County they have increased the joint spacings from 25 to 35 feet and finally to 50 feet, and at the pres-

ent time see no reason for reducing the last distance. "I doubt very seriously the necessity for steel protecting plates, for no matter how carefully they are placed, there is a tendency to chip, thus demanding an almost immediate tarring of the joints. I believe the joints of the future will be merely felt or paper with a slight rounding of the joint with an edging tool, which will be filled in by the pounding down of the felt which has been permitted to stick up above the surface. I believe that the ability to get concrete that is homogeneous and impervious to water will have a marked effect upon the spacing of joints, as water content is more the cause of the movement in concrete than the changes in temperature."

For shoulders he prefers earth to gravel; and has found it unnecessary to bevel the edges of the concrete. Finally, he emphasizes the fact that a concrete road more than any other requires the most careful inspection by a man of judgment who appreciates to the utmost the importance of detailed work.

HIGHWAY DEPARTMENT RECORDS.

Use of Card Catalogue System for Keeping Complete Records of Highway Work and Conditions—Two Cards for Each Highway.

A state highway department, which has charge of the construction and maintenance of hundreds of miles of roads, should rapidly collect an amount of data concerning cost, durability, etc., which would be of enormous value in improving practice in road work. Unfortunately, many and perhaps most states do not keep such records, or do not keep them in a form convenient to be readily consulted; and those which actually study the records of their roads and profit by them could probably be counted on the fingers of one hand. The New York State highway department has, during the past year or two, been endeavoring to greatly improve upon its system of keeping records, and the work done was described in the last report of the commission by Philip P. Farley, consulting and efficiency engineer to the commission.

He adopted the card system, two cards being prepared for each highway. One card gives all the essential facts in connection with the highway, such as the number of the highway, county in which located, length, width of pavement, square yards (computed from actual quantities of materials paid for), date of contract, date work was begun, date of acceptance, traffic in tons per day of twelve hours (based on actual tallies), type of pavement, thickness and kind of material used and total cost. Also cost of supplemental contracts, if any, engineering charges, cost of pavement proper per square yard and of each course of the pavement; also, for comparison, cost of pavement reduced to a 16-foot width. The second card is known as a "narrative" card and is made up to read in narrative form, giving practically all the information on the other card but in a more consecutive and readable manner; this being designed for executive officers and other state officials and for the layman generally. This description is given in about 400 words. This card also contains the cost of maintenance, expressed not only in dollars and cents but also in dollars per mile per year and cents per square yard per year; the costs being also divided into the three divisions of

general maintenance, repairs and reconstruction. This card also contains the cost of the patrol per mile per year and of engineering and inspection. Cards have been completed for all of the highways so far built by the state.

At the time of the report there was also under way a tabulation of all the data shown on the cards, in which one line is given to each highway (indicated by number), there being thirty different columns showing every useful item of information respecting it. A second tabulation, drawn from the first, gives special information respecting maintenance, which in a particular manner calls attention to the changes in unit costs from year to year.

Mr. Farley states that statements as to cost of maintenance and of construction have heretofore been based on insufficient information concerning all the state highways. For instance, it has repeatedly been said that broken stone roads cost \$1,000 per mile per year to maintain and must be rebuilt in seven or eight years. The records, now properly compiled for the first time, do not show this. One record of twelve waterbound roads, each twelve years old, gives their cost of maintenance as 6.34 cents per square yard per year, equal to \$640 per year for a 16-foot width. Another record of twenty-one eleven-year-old roads gives \$525 per mile per year as the average rate; while twelve ten-year-old roads cost \$410 per mile per year. All of these roads received oil treatment at various times, the cost of which is included, as is also the cost of such reconstruction as was necessary. While the roads referred to are not subjected to heavy travel, they were of sufficient importance to receive the early attention of the state department, and are typical of the great majority of those of the state.

Following are shown illustrations of two cards for state highway No. 638, Ontario County, which indicate how these records are filed in the New York State Department. The upper card gives all information concerning the road in concise and compact form, suitable for the use of the engineering department; the lower one is the "narrative" card.

Hy. No. 638	Name, GENEVA	County, ONTARIO
Length 1.01 miles; 5,333 feet; width 14 and 16 feet; 8,388 sq. yds.		
Cont. aw'd'd Feb. 19, '10; wk. st'd May, 1910; contract { Nov. 15, '10; con- } Aug. 1910	date of completion {	tract completed }
Contractor, Fred. A. Brotsch, Jr.; address, Rochester, N. Y.		
Sub-soil,.....; traffic, 1,250 tons per 12 hrs.; type-pavement, bit. macadam.		
Sub base course, approved stone;	depth, 4 in.; cost, 0.333 per sq. yd.	
Base course, approved stone,	0.262	0.248
Surface course, app. stone; bit. mat. Stand. "A"-Barrett "T"; depth,	2 in.; cost,	0.510 per sq. yd.
Other contract items.....; cost, \$2,411.85; unit cost, \$0.006 per sq. yd.		
Original contract cost, \$10,746.20; Eng'rs est., \$13,400.00; State appo., \$6,212.50		
Supple'l contract cost, Less 269.67; Eng'rs est.,.....; County appo., 6,212.50		
	\$10,476.53	
Eng. and adv. ch'ges, 1,948.47; Eng's est.,..... Village } appo.,.....		
	Town }	
Total highway cost, \$12,425.00; Eng'rs est., \$13,400.00; Total appo., \$12,425.00		
Total highway cost per mile, \$12,300; pavement cost per mile, \$7,980; maint. per mi. per yr., \$90		
Total eng'ring cost per mile, \$1,930; other item cost per mile, \$2,390		
Total equivalent cost for 16-ft. pavement, \$9,010		

ONTARIO COUNTY.

GENEVA ROAD.

ROAD No. 638.

This road is 1.01 miles long, is paved for width of 14 and 16 feet and has a paved surface of 8,388 square yards. The original contract was awarded to Fred A. Brotsch, Jr., on Feb. 19, 1910, at his bid price of \$10,746.20. The total original cost of this highway including supplementary agreements (\$279.67 decrease), engineering and other charges was \$12,425.00. This is equivalent to an average cost of \$12,300.00 per mile. The type of this construction was bituminous macadam. The base course was 3 inches thick of approved stone and the surface course was also 3 inches thick of approved stone and Bit. Mat. "A" (Standard) and "T" (Barrett). The cost of the top course including binder was \$0.510 per square yard or at the rate of \$4,790.00 per mile of 16-ft. road. The cost of pavement as a whole was \$0.96 per square yard or at an average rate of \$7,980.00 per mile. This is equivalent to an average rate of \$9,010.00 per mile for a 16-ft. pavement. The difference between the pavement cost (\$7,980.00) and the total contract cost per mile was due on the one hand to other contract items including excavation at an average cost of \$2,390.00 per mile and on the other hand to engineering and advertising charges at the rate of \$1,930.00 per mile.

The records of the Bureau of Maintenance and Repair to Dec. 31, 1913, show expenditures on this road amounting to \$327.00, all for general maintenance.

These maintenance charges amount to \$90.00 per mile per year or to \$0.111 per square yard per year for a period of 3½ years.

The cost of patrol was \$74.00 per mile per year. There were no charges for engineering.

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CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for. Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

APRIL 1, 1915.

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Importance of Location.

Reams of paper and scores of articles are being used monthly to discuss or advance ideas on methods of constructing and maintaining road surfaces, but little is said about the most important matter of all—the location of the road. Road surfaces can be changed in character as they wear out—in some cases must be changed—at little or no additional cost; but if the location is changed, the previous expense for right of way, grading and foundation are a complete loss.

A farmer having a house on a knoll lays out a farm road from this house, north and south, to the nearest highways. Travel desiring to cross between these highways uses this road, and in time it is taken over as a public road, although a road along the foot of the knoll might not only save a heavy grade, but be actually shorter. Almost any road engineer can recall such a case; and many have been persuaded or directed by higher authority to continue and permanently improve such a location—a permanent and absolutely unnecessary tax on every user of the road, imposed by the ignorant or obstinate official responsible for it.

If money cannot be found, in such a case, to both purchase a new right of way and construct a new hard surface, the former is preferable; and an expensive surface should under no consideration be placed on a poor location, for every additional dollar so spent is another argument for perpetuating the mistake.

Another condition which, unfortunately, decides the location of many roads in western states is the universal division of farms by section lines and location of roads exactly on such lines. Such a road may cross a single stream two or a dozen times; several are recorded as crossing back and forth over a winding railroad, and in numerous cases they climb unnecessary hills, requiring very expensive grading. Land certainly is not so expensive on large farms that a right of way could not be purchased following one bank of a creek, or around a hill, at less cost than the bridges or grading required by the section line location. If the owners were persuaded that it was the official location or nothing, they would probably give the land. And if the road is to be a highway for the use of state citizens generally, their interests and not those of the owners should prevail.

The location of a public highway is the only permanent thing about it, and should be treated as correspondingly important.

Maintenance.

Only second in importance to location is maintenance. It is more important than wearing surface construction in the majority of cases. (Swamps and deep, coarse sand are the principal exceptions.) A dirt road, if continuously well maintained, will carry any traffic. But the best of surfaces, if neglected, will go to pieces—many of them even if there is no traffic. An improved surface is not a substitute for maintenance, but a method of securing, at a less cost of maintenance, a hard, smooth surface under exacting conditions of traffic and weather.

Every state should, of course, improve its main roads as soon as possible. But because it cannot find funds or authority to do so, the existing road authorities should not be content to do nothing, but should keep the existing roads in good condition by intelligent constant maintenance. And each state will probably always have hundreds if not thousands of miles of dirt roads which can, by the same attention, be kept in as good condition as the amount of traffic over them warrants.

Mileage of Good Roads in the United States.

We have frequently been asked to give the total mileage of highways in the United States, the total amount of macadam road in the United States, etc., and have been compelled in every case to reply that we do not have such figures and do not know where they could be obtained. In a recent publication of the Office of Public Roads, which was issued only a few weeks ago, are given figures for the total amount of highways in various counties and states of the Union. In connection with these figures the following explanation is given: "The reports on the mileage of road constructed from the proceeds of local bond issues are very incomplete and in many instances contradictory. After eliminating all reports which were obviously incorrect or defective, a list of counties and districts giving complete returns of classified mileage of road constructed has been made. A similar list for township work has also been made. It is quite probable that omissions in reports from counties and their subdivisions concerning mileage built are due in part to the frequent changing of local officials."

An inspection of the tables shows that a very considerable percentage of counties are not represented at all therein, and eleven entire states are missing from the list of roads in "counties, districts, beats and townships"; while less than half of the states are included in the list of townships and towns. While it is very probable that the states, counties and townships which are not represented in the tables have in the majority of cases done little or no road work, still it would appear that these figures must fall far short of being complete. These refer only to roads with some kind of surfacing, and take no account of natural soil roads, for which no figures seem to be obtainable for the entire country which would be more than guesses.

The amount of bonds voted by the several counties, districts and towns, however, can be ascertained, and these are given as totaling \$229,403,355 for counties and districts (of which only \$63,932,720 is accounted for by the data of roads built, as just referred to); and \$57,153,718 for townships (\$4,623,625 accounted for). These figures show more clearly how small a proportion of all the roads built the government officials could obtain data for.

If there is any organization, either private or governmental, or any other medium for the collection of road statistics of the country which could obtain complete and reliable information upon the subject, it would seem that the Office of Public Roads must fill that position; and when we find that this agent of the Federal Government is unable to obtain even approximately complete statistics of even the surfaced roads in the country, it would seem useless for any others to attempt to compile or in any other way obtain complete records of this kind. Nevertheless, as this is the most complete record which we have, we are presenting elsewhere in this issue a tabulation by states of the data collected by the Office of Public Roads. These records are up to January 1, 1914, and we have supplemented them by records collected ourselves from state officials giving state work and state aid work done during the year 1914.

Incomplete as they are, the tables give an indication of the extensiveness of the good roads movement. Up to January 1, 1914, the counties, districts and other state subdivisions had voted bonds to the extent of \$286,557,073, and from \$68,556,345 of this had built or had under way 15,427½ miles of roads, of which 6,184 were gravel, 3,775 were macadam, 3,123 sand clay, 786 were bituminous macadam, 1 of bituminous concrete, 155 of concrete, 294 of brick, and the remainder were various local materials. As stated above, these figures (except the total bonds voted) include incomplete results from thirty-three states only.

To January 1, 1914, the states had voted \$158,590,000, but of this only \$88,476,000 had been issued up to that time.

Altogether the report gives the total amount of state, county, district and township bonds voted up to January 1, 1914, of \$445,147,073.

Road Construction Terminology.

The following letter explains itself, and gives additional emphasis to the ideas we expressed in the article referred to. We would call special attention to the last paragraph of Mr. Crosby's letter.

Editor, The Municipal Journal,
50 Union Square, New York, N. Y.

Dear Sir: Permit me to express my gratification at your generous review in your issue of March 4th of the report of the Special Committee on "Materials for Road Construction," etc., of the American Society of Civil Engineers. I believe the other members of the committee will also appreciate it.

I was glad to see you emphasize the matter of terminol-

ogy, one in which I have worked for some time, and I am pleased at the support you accord our general proposition as to the desirability of greater concordance in the use of many highway terms. In the past, the exact meaning, on which so much may depend, of expressions used irregularly and more or less loosely by many engineers in their statements, has been difficult to secure without going back to the author for more details as to what was intended. This interrogation has often been impracticable and consequently many times a statement had to be discarded because of its ambiguity when it might have been extremely important. If now greater uniformity in the use of common expressions concerning highway work can be had, fewer such discards will have to be made and consequently conclusions will rest on a wider basis.

The definitions of technical terms, or perhaps they should be called ordinarily common terms with special technical meanings, we feel is not so much a matter of exact accuracy as a matter of substantial correctness and uniformity in the general use if the greatest and quickest good is to be had. The same remarks might be made about the specifications for the tests. In both matters any two or more men conversant with the subjects would probably differ regarding the details, but all these differences were thoroughly considered and thrashed out by my committee, the consideration of some of them extending over a period of more than five years. Concessions were made by individuals for the sake of unanimous agreement on the basis mentioned, and it is believed and hoped that minor concessions now by individual highway authorities and agreement generally on the same basis with the committee's proposition will be of much benefit, as suggested by you.

With a view to obtaining specific criticism on the terminology, tests and other matter presented by the committee in its recent report, a special meeting for the discussion of the report was arranged by courtesy of the Board of Direction of the society and was held at the society house on Friday, January 22d. Some such criticisms were made there and will be carefully considered by the committee prior to its next report. The opportunity is open for the submission of further discussion which the committee will welcome. Members of the Am. Soc. C. E. may present their remarks directly to the secretary of the society for printing in the society's publications. The undersigned, as chairman of the committee, or the secretary of the committee, will be glad to receive any discussion from non-members of the society.

Very truly yours,

Baltimore, Md.

W. W. CROSBY.

MAINTAINING BITUMINOUS SURFACES*

Construction Engineers Should Have Charge of Maintenance—Applying Paint Coat to Macadam Roads—Materials and Methods Used.

Organization is an essential feature of good maintenance. The maintenance organization should not be separated from that of the construction, as separate organizations are apt to result in an overlapping of jurisdiction and a tendency to shift responsibility. It is obvious that the logical organization to maintain a given system of pavements is the one that saw them laid and is familiar with every detail of the construction, as very often a knowledge of apparently trivial conditions in connection with the construction bears an important part in the future maintenance. Moreover, where the construction organization is not charged with responsibility for the maintenance, there is bound to be a subtle influence which will in a measure result in this division taking little or no active interest in the pavement after it is completed.

It is the intimate knowledge of details of both construction and maintenance, not considered separately but in their relation to one another, that is so desirable as a guide in highway engineering. Construction and maintenance are dove-tailed together and cannot be con-

*Abstract of paper before the American Association for the Advancement of Science, by William H. Connell, Chief of the Bureau of Highways and Street Cleaning, Philadelphia.

sidered separately, either as to their physical characteristics or their cost. Even street cleaning should be considered a part of the maintenance work which should come under the jurisdiction of the highway department. In fact, in an older city where a large percentage of the streets have already been paved, the maintenance problem predominates and requires the greater part of the attention of the department.

There is always a tendency among engineers to be lax in attention to details of an apparently simple and routine nature. They are apt to overlook the fact that it is no trick to construct a pavement, as in supervising this work they are simply following more or less standard and well-defined principles; but in maintenance work there is no set specification to follow, and the success depends upon attention to detail routine and principally to petty details that present themselves in the actual physical work, and in this there is an unlimited field for initiative. Personal experience in observation of wear and peculiarities of the different types of pavements and road surfaces is invaluable as a guide in research work, as there is not a pavement to-day that cannot and should not be improved upon.

For convenience the different branches of maintenance are classified as: 1, routine maintenance; 2, general maintenance; 3, emergency maintenance.

Routine maintenance includes regular street cleaning and other work of this character that should be performed under a definite schedule.

General maintenance includes repairs and involves different kinds of work, each requiring special knowledge on the part of those engaged in the actual performance of the physical work for which special gangs have to be organized. For instance, stone block, wood block and brick repairs require skilled laborers who have made a specialty of this work; while repairs to asphalt and bituminous pavements must be performed by men specially skilled in this line of work. The usual subdivision includes these three classifications of block pavement: bituminous pavement, and macadam, bituminous surface treatment and earth roads. The best work requires a separate organization for each of these, made up of men specially trained in that particular branch of work. But the character and amount of the work is of such indefinite quantity, which can be performed only in seasons of the year when weather conditions are suitable, that it is difficult to maintain a good-working organization.

Emergency maintenance consists of such work as snow removal and taking care of extensive washouts, both of which require an emergency force, since it is necessary to put on an indefinite number of men, depending upon the volume of work, usually for only a short period of time. This means that the organization must keep in touch with all the available sources from which men can be employed on short notice.

Bituminous surface treatment is really the newest problem in highway maintenance, and it might be well to outline a method which has been in successful use on this class of work for several years. It is assumed that such surface treatment will be performed only on macadam roads that are thoroughly shaped up and have received proper compression under rolling and traffic, and that the traffic which they carry is suitable for this kind of treatment, namely, largely automobile and not too heavy in volume. If the theory could be carried out of applying a paint coat each year, to be covered with chips or gravel which will not form a pad, which necessitates patching and is apt to push and roll under traffic, this would be the most desirable method of applying bituminous surface treatment. This theory has been successfully carried out and has almost indefinitely prolonged the life

of the pavement; incidentally solving the dust problem as well.

The amount of material Philadelphia uses in these treatments is about two-tenths to five-tenths of a gallon to the square yard; the first application usually requiring one-half gallon, the second year one-third, and after the third year about two-tenths of a gallon to the square yard. The method of applying the surface treatment is as follows: First, the surface is thoroughly swept with horse-drawn and hand brooms until all the fine material has been removed and the surfaces of the stones are exposed. The bituminous material is applied by either an automobile or a horse-drawn pressure distributor at the rate of two-tenths to five-tenths of a gallon to the square yard, depending upon the requirements in each particular instance. The portion of the roadway treated is then closed to traffic for about twelve hours, after which a light layer of stone chips free from dust, or of fine washed gravel, is spread. The quantity of chips or gravel used varies from 15 to 18 pounds to the square yard, depending upon the character and quantity of bituminous material applied. After the gravel or chips have been spread the road is open to traffic.

The city has used both tar and asphalt cut-back in this work, the former for a number of years. The asphalt cut-back, however, has been used in Philadelphia for three years only, and has worked out very satisfactorily and will continue to be used somewhat extensively in this year's work, the tar treatment also being used.

The specifications for asphalt cut-back cover the naphtha, the asphalt and the combination of the two in the proportion of 35 per cent by weight of naphtha and 65 of asphalt. The naphtha has a specific gravity of 53° to 55° Beaume. The asphalt has a specific gravity of 1.02, and a penetration of 140 to 160 for 100 grams for 5 seconds at 77° F. and not less than 40 for 200 grams for 1 minute at 32° F. The specifications for Ugite, both cold application and hot application, for Tarvia A and Tarvia B are given, which specify the specific gravity, free carbon, viscosity, melting point and distillation.

The relative costs of these different treatments, as described above and including cleaning and applying the material, are as follows:

New treatments, using one-half gallon of bituminous material and sixteen pounds of washed gravel or chips; using Tarvia B, 7 cents per square yard; using Tarvia A, 7.7 cents; using cut-back, 9.3 cents.

Retreatment, using an application of one-third gallon of bituminous material and sixteen pounds of washed gravel or chips; using Tarvia B, 5.4 cents; using Tarvia A, 5.9 cents; using asphalt cut-back, 7 cents; using Ugite (cold), 5.7 cents.

The difference in cost between the new treatment and retreatment is occasioned not only by the different kinds of material used, but also by the cost of cleaning and sweeping. Sweeping for the new treatment cost 2.2 cents, and for the retreatment 1.4 cents per square yard.

The cost of materials and labor was as follows:

Gravel, \$2.14 per ton on the road; chips, \$2.30 per ton on the road; Tarvia B, 7 cents per gallon applied; Tarvia A, 8½ cents per gallon applied; asphalt cut-back, 11 2-3 cents per gallon applied; Ugite, 8 cents per gallon applied; foreman, \$100 per month; assistant foreman, \$3 per day; laborers, \$2 per day; machine sweepers, \$5.50 per day; teams for hauling, \$5 per day.

Even allowing for the high prices paid for gravel, chips, etc., these costs are somewhat higher than they should be, because the men and many of the supervising force were unfamiliar with the class of work. It is expected to obtain lower costs this year.

The WEEK'S NEWS

Oklahoma Highway Legislation—Pennsylvania's Coal Taxes for Roads—Wisconsin Board of Health Proposed Reorganization—Massachusetts Water Supply—Waterworks Improvements for Sacramento and Mobile—Grand Rapids Gas—Lighting in Columbus, Duluth and Tucson—City Manager of Phoenix Ousted—Commission Victories and Defeats—New Charters—Clean-Up in Baltimore, Wilmington, N. C., Milwaukee, Racine, Maryville, Mo., and Marion—The Jitney—Tree Planting in Massachusetts Cities.

ROADS AND PAVEMENTS

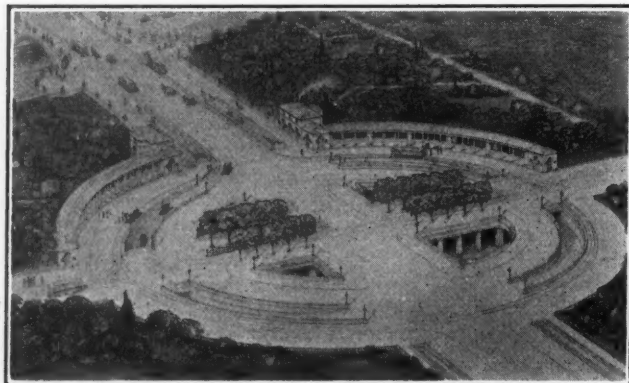
Oklahoma Highway Legislation Passed.

Oklahoma City, Okla.—As amended by the senate and finally agreed upon by a conference committee, the administration good roads bill, carrying into effect a complete revision of the state highway commission was passed finally by the house of representatives. The bill so far as it relates to the office of the state highway department, is in a much different form than it passed the house, but the general scheme of the highway system remains practically the same as proposed in the original measure. As originally passed by the house the bill, in addition to providing for carrying out the general road system, provided only for the appointment of an engineer at a salary of \$2,500 to be appointed by the board of affairs and who would, with the engineers of the state university and the A. and M. college acting in an advisory capacity, succeed to the duties now performed by the state highway commission. Certain duties were also imposed on the board of affairs as recommended by Governor Williams. The bill as it was amended by the senate takes all road matters out of the hands of the board of affairs, and provides for a highway commissioner at a salary of \$2,400; an assistant commissioner at a salary of \$1,500; an engineer at a salary of \$2,100 and one stenographer at \$1,000. The senate receded from its amendment, which struck out that portion of the bill providing that 25 per cent. of license tax fees should be retained by the city where the tax is collected.

Proposed \$2,000,000 Bridge for Detroit.

Detroit, Mich.—Plans have been completed by Barclay, Parsons & Knapp, assisted by Consulting Architect Cass Gilbert, for the new \$2,000,000 Belle Isle bridge on the site of the present one, proposed in the traffic report of the board of Street Railway Commissioners. The plan proposed in the traffic survey and the plan of Park Commissioner Dust both agree that any new bridge built should be on the site of the present bridge. It will cost \$2,000,000 for the bridge and its approaches and terminals. The extensive parking improvements and the purchase of property on Jefferson avenue would raise the cost considerably. The bridge will be built of reinforced concrete, of sufficient width to provide for a double street car track and two rows of vehicles in each direction, with ample sidewalk room on each side.

One of the illustrations shows a general perspective. The drawspan over the channel is the fourth span from



Courtesy, Detroit (Mich.) Journal.

PARKING FOR NEW BRIDGE APPROACH.

the Detroit side—the draw is a “jack-knife” type, operated by motors concealed in the heavy piers. The street cars going to the island pass across the bridge and down into a subway station below the surface of the bridge at Belle Isle. The new bridge could be built in portions, leaving portions of the old bridge standing, so that bridge connection with the island can be continued nearly the whole time. Grade separation is provided between the street car and the vehicle traffic. The extensive parking arrangements proposed, with the bridge in the center, is shown in the smaller picture, which gives a view of the Jefferson avenue approach.

Wants Separate Roads for Horses.

Boston, Mass.—A resolve authorizing the Massachusetts Highway Commission to investigate and report to the next legislature on the feasibility of so constructing State highways that a space for horse-drawn vehicles may be reserved on either side of the road, has been reported favorably to the house. Proponents of the proposition claim that such a reservation would tend to prevent the falling of horses, a frequent occurrence on the highways now.

Counties May Issue Road Bonds Without Election.

Duluth, Minn.—Counties of Minnesota are invested by law with authority to issue, without a special election, bonds to finance the construction of state rural highways built under the Elwell law, according to a decision handed down by the state supreme court in a case appealed from the St. Louis county district court. The question has been a subject in dispute since the Elwell law passed in 1911. Judge Fesler, of the district court, held that county boards had authority under the law to issue the bonds without a special election, when it was desired to finance the construction of a state rural highway built under the Elwell law. The suit was brought to clear up legal difficulties which had proved stumbling blocks for bonding companies. Attorneys for bonding companies which had refused to handle the bonds had frequently raised the question and as it was practically impossible to dispose of the bonds it was decided to make a test case of an instance in this county. About ten or twelve counties in the state have been experiencing difficulties of a similar nature with reference to disposing of bonds issued by county boards under the same law.

Want Coal Taxes for State Roads.

Harrisburg, Pa.—The fight of the municipalities throughout the anthracite coal fields to have the Roney coal tax bill enforced may come to naught as far as the municipalities themselves are concerned, providing a bill drafted by Attorney General Francis S. Brown becomes a law. The bill provides that the money realized from the 2½ per cent. tax on the tonnage of coal mined placed by the original bill, shall be turned over in its entirety to the State highway department instead of being partly distributed among the counties supplying the coal and the State. The passage of such a bill would mean an annual loss of \$500,000 to each of Luzerne and Lackawanna counties, while the remaining counties with mines of anthracite coal would suffer losses of almost the same proportion. Litigation has been carried on by these affected counties during the past year to have the State enforce the Roney bill which some of the companies were alleged to be attempting to dodge. By the passage of such a bill the highway department would receive seven million dollars additional which would otherwise go partly to the general funds of the State and partly to the treasuries of the counties.

SEWERAGE AND SANITATION

Board of Health Wins Suit.

Topeka, Kans.—The Kansas board of health and the health officers of Kansas City, Kan., won their fight in the supreme court to compel the milkmen to furnish undiluted milk. Frederick H. Meyer, of the Meyer Sanitary Milk company of Kansas City, sold some milk which did not come up to the standard prescribed by the state board. He was arrested, but the Wyandotte county district court threw the case out of court because the county attorney did not specify that the milk had been "adulterated by adding some foreign substance which tended to reduce its quality" and that the board of health did not have authority to make regulations as to the contents of milk or any other article of food. The supreme court held that the board of health was created for the express purpose of making regulations on food standards, and that it did not concern the court how the adulteration was made, as long as the food was not up to standard.

To Consolidate State Departments.

Madison, Wis.—More than a score of departments, bureaus and boards will be wiped out and a consolidation of the business activities of the state will be effected by bills that are now in preparation. The proposed legislation will mean a simplification of business, a reduction in the number of high salaried officials, and in a saving of office room in the state capitol. The most important recommendation that has been made by the legislative committee, and which has been put in form of a bill, provides for the establishment of a board of public welfare. It is intended to consist of five members, each at a salary of \$4,000 a year, with a six year term, the members to be appointed by the governor with the consent of the senate. One member is to be a doctor of medicine, one a dairy and food expert, the third a penologist and the other two business men. The board of public affairs, as proposed, will combine the activities of the present state board of control, state board of health, the state dairy and food department and the oil inspection department and the treasury department. It is proposed by the creation of this board also to abolish the present state barber's board, the pharmacy board, the medical board of examiners and the dental board of examiners.

Work on Sacramento Sewers.

Sacramento, Cal.—The second unit of the big suburban district storm sewer has just been completed by the Ross Construction Company. The outfall sewer and gate were finished some weeks ago by J. W. Terrell. The sewer is nine and one-half feet in diameter, and capable of carrying off all the water and sewage from the suburban districts. The second unit cost \$54,000. The pumping station has also been completed. This latter unit of the sewer system cost \$100,000. The Ross Construction Company already has begun operations on the third unit and will be able to proceed with construction as soon as Commissioner Coulter succeeds in closing negotiations for rights of way.

WATER SUPPLY

Water Storage in Massachusetts.

Boston, Mass.—That the state's water resources are being gobbled up by private interests and that unless some change of policy is immediately instituted Massachusetts will have to face a water famine is brought to the attention of the legislature in a report on the conservation and utilization of waters by the state board of harbor and land commissioners. The amount of water power used by manufacturers has increased enormously in the last few years. For instance, proprietors of Locks and Canals in the city of Lowell consumed in 1912 about 11,620 horsepower, developed from the Merrimac river, according to statistics of the United States Bureau of Corporations. A survey in 1915 by the harbor and land commissions shows that these same Locks and Canals now use 29,911 horsepower. The water used and wasted by municipalities is also mentioned in the report. The commission urges that a definite plan be laid out by the state for the control and conservation of the water resources. The Merrimac river is capable of further development, according to United States Engineer C. C. Covert of the Geological Survey, who is quoted as saying that, although the most favorable opportunities for storage on the Merrimac are being utilized, there are still many unutilized reservoir sites available. The commission on harbors and public lands holds that unless the state within a reasonably short time asserts a definite policy of control, the waters in the rivers and natural streams, which belong to the people of the whole state will be devoted entirely to



Courtesy, Detroit (Mich.) Journal.

THE PROPOSED NEW BELLE ISLE BRIDGE.

private uses. In contrast to the situation in Maine, New Hampshire, Vermont, New York and the province of Ontario, where a conservation program is now under way, nothing at all has been done in Massachusetts. The control which exists of the water resources is divided among four or five different bodies, no one of which has complete authority. In the year 1912 the United States Bureau of Corporations made a tabulation which showed that 130,620 horsepower was owned by the larger companies in Massachusetts. The harbor and land commissions, canvassing the same people, have discovered that within the three years the total horsepower developed has increased to 264,152. Massachusetts manufacturers are now paying nearly \$26,000,000 a year for the purchase of fuel for power purposes. Intelligent plans to avoid freshet damages and to store water for irrigation are also urged.

Plans for New Water System.

Sacramento, Cal.—Sacramento will have a single water distributing system instead of a domestic and high pressure fire system, according to a report made to the city commission by G. H. Wilhelm, who has been employed, with Professor Charles Gilman Hyde, to pass on plans for the water and sewer mains and select a source of water supply for the city. Wilhelm and Hyde are revising the plans to increase the pressure in the business section from forty to forty-five pounds to from seventy-five to eighty pounds, decreasing to from sixty to sixty-five in the residence district. This pressure in bigger pipes will supply an adequate fire and domestic supply.

Buys New Watershed.

Mobile, Ala.—The city commissioners have purchased 890 acres of land in the Clear creek watershed for \$4,100. The land takes in a large watershed and gives the city an excellent supply of clear water in addition to that already owned. Mayor Pillans stated that the average daily pumpage had been decreased to 9,800,000 from 13,500,000 gallons and that the number of hours of pumping during February had been reduced from 720 and 740 at the two stations to 534 and 554. The mayor stated that the decrease was due to the fact that the meter system was being used more generally by water users than it was three years ago and that constant inspection was reducing water waste.

Water Filtration in Fort Worth.

Fort Worth, Tex.—Ninety million gallons of water were filtered at a cost of \$17.62 per million at the filter plant in February, City Chemist Guy Eldredge reported to Water Commissioner Blanke. The plant was in operation 432 hours. The cost per million gallons for filtering was distributed as follows: Superintendent, \$1; labor, \$1.44; power, \$0.216; light, \$0.124; alum, \$3.343; lime, \$5.275, and soda ash, \$1.789. The low service pumpage cost \$4.43 per million gallons. The maximum hardness of raw tested out 228 parts per thousand as a maximum, 197 as a minimum and 206 as a mean proportion. The maximum hardness of filtered water was 113 parts per thousand as a maximum, 60 as a minimum and 83 as a mean proportion.

Newark's Water Works Profitable.

Newark, N. J.—Net profits of the Newark water department for 1914 were \$148,833.03, the best showing in its history. In addition, \$795,382.09 was set aside for sinking fund and interest, thus making the earnings from operation close to \$1,000,000. These figures are shown in schedules submitted by Chief Accountant David Holmes to the Board of Works. In 1913 the net profits, after sinking fund and interest payments, were \$99,182. Sinking fund and interest payments were \$12,708.56 more in 1914 than in 1913. As water rates were reduced January 1, the showing, in the view of officials of the department, is the best that may be expected for some time. The rate is now \$1 per 1,000 cubic feet. The revenue of the department in 1914 was \$1,366,333.47, as compared with \$1,281,849.93 in 1913. The operating expenses in 1914 were \$427,275.15. The profits for the last two years have entirely wiped out the deficit that piled up in previous years and leaves a surplus of \$37,181.70 in the banks. Before 1913 there had been an operating deficit for several years after payments for sinking fund, interest and other charges. The sinking fund, amounting to \$6,000,000 December 31 last, earned last year

\$217,201.80. If this amount were added to the operating earnings the total would be \$1,161,416.92. This is almost six per cent. on the \$20,800,000 spent in the development of the water system, including outlay for land, high pressure mains, ordinary mains, fixtures and everything else. It is better than eight per cent. on the outstanding bonded indebtedness of \$14,000,000. Besides providing cheap water, the department, with its sinking fund, often plays banker to the city. Bonds for numerous city improvements have been purchased by this sinking fund at rates below what the city would have obtained the money for at big private institutions. Nevertheless, the sinking fund promises to contain enough money to retire the whole debt before the bonds mature. The assets of the water department are \$26,000,000, made up principally of the appraised value of the water plant, which is carried at \$19,038,714.42, and the \$6,000,000 in the sinking fund. Its liabilities are the bonded debt of \$14,000,000 and obligations, including deposits and interest, amounting to \$178,593.30.

City Wins in Water Tax Case.

Annapolis, Md.—The municipal authorities have won the first skirmish in the suit brought against the county to restrain the collection of taxes on the Annapolis Water Company's property, located four miles from the city. The Circuit Court handed down an opinion sustaining the city's contention that the water company is a municipally owned corporation, and is, therefore, not subject to county taxation. The county officials will carry the case to the Court of Appeals for a final decision. The county commissioners and county treasurer were the chief defendants. The municipality acquired absolute control of the water company nearly two years ago, when the State's holdings in the company were purchased. To consummate this purchase the city floated an issue of bonds. At the last session of the legislature a bill which, among other things, provided for the exemption of the plant from taxation for county purposes was enacted, but much pressure was brought to bear on Governor Goldsborough, with the result that he declined to sign the measure. The city has refused to pay the taxes on the property for the last two years, and recently the water works property was advertised for sale by the county treasurer along with other county property, to satisfy unpaid taxes. This proceeding was abandoned, however, as the city, in the meantime brought the injunction suit. The chief contention made by the county officials is that the water company is not a municipal concern, because its affairs are governed by a board of officers, apart from the members of the City Council.

STREET LIGHTING AND POWER

Grand Rapids Opposes Gas Franchise.

Grand Rapids, Mich.—Following the report of William C. Newbigging, the English gas expert, who made a survey of the gas situation here, the citizens voted against the 75-cent gas franchise at a referendum election, the result being 7,050 in favor to 7,069 against. In order to get a renewal of the franchise it was necessary that 60 per cent. of the vote cast be in favor of it. The enabling act, which called for the revision of the charter to permit the renewal of the gas company's franchise before the expiration of its present franchise during the next five years, was also defeated by a vote of 6,443 to 6,249. In his report, Mr. Newbigging showed that it was possible for the company to sell gas at 66.69 cents per 1,000 cubic feet and yet make a profit of 8 per cent. Some of the figures of Mr. Newbigging show that the distributing system comprises about 210 miles of cast iron and steel main pipes; that there are 31,785 consumers, 24,247 services, and 14,338 house governors. The cost to the company of the distribution of gas amounts to 6.84 cents per 1,000 cubic feet sold:

	Cents.
Street main maintenance.....	.21
Service maintenance .....	.21
Street department expense.....	.77
Pumping gas .....	.12
Meter maintenance	2.23
Meter department expenses.....	.46
Setting and removing meters.....	.46
Gratuitous work .....	.71
Gas unaccounted for.....	1.67
Total	6.84

The cost of collection for the period under review amounted to 3.55 cents per 1,000 cubic feet sold, and is made up as follows:

	Cents.
Reading meters .....	.44
Clerical salaries	1.80
Official expenses .....	.61
Rent of office .....	.22
Delivering bills .....	.14
Outside collection .....	.34
Total cost of collection.....	3.55

The general expenses amounted to 11.29 cents per 1,000 cubic feet and are summarized below:

	Cents.
Executive salaries	2.13
General clerical salaries .....	.72
General office expense.....	.20
Incidental expenses .....	.65
Rent of office .....	.12
Legal expenses .....	.01
Promoting new business .....	.93
Taxes	6.53
Total general expenses.....	11.29

The following table summarizes the cost of manufacture, distribution, collection and general expenses incurred per 1,000 cubic feet, sold for the year ending December 31, 1914:

	Cents.
Manufacture	18.40
Distribution	6.84
Collection	3.55
General	11.29
Total operating expenses.....	40.08

Taking 8 per cent. as the rate of interest on the common stock, certificates of indebtedness, and the reconstruction of reserve, and 5 per cent. on the bonds and consumers' deposits, the following charges, per 1,000 cubic feet sold is obtained:

	Cents.
Common stock	14.30
Certificate of indebtedness.....	.64
Reconstruction reserve	4.24
Bonds	7.37
Consumers' deposits .....	.06
Total	26.61

Adding this figure of 26.61 cents to the cost of the distributed gas, i. e., 40.08 cents, gives a total of 66.69 cents.

Gas Company Does Not Obey Order.

Evansville, Ind.—The Evansville Public Utilities company, which was recently ordered by the Indiana state public service commission to reduce the price of gas from 97 to 85 cents per 1,000 cubic feet, sent out its bills based on the old rate. Immediately Mayor Bosse issued a proclamation to the public advising the consumers to tender the gas company payment based on the new rate and to pay no more. The mayor also threatened to annul the contract for city lighting now existing and to build a municipal plant. The bills appeared twenty days late, the company having assigned various reasons, among them pending litigation, for its failure to appear on schedule time. The company, after failing to obtain an injunction against the state commission in the local superior court, took the case into the federal court, where it is pending. City officials assert that the action of the gas company in issuing bills at the old rate is anticipating the decision of the federal judges.

Columbus Street Lighting Costs.

Columbus, O.—A detailed statement of the cost of various forms of street lighting and cost of operation of the municipal light plant has been prepared by Superintendent H. E. Eichhorn and W. T. McAndrew, head bookkeeper of the plant, for experts who are now engaged in making a survey of the local plant to establish a new method of accounting. The statement shows the cost of operation of the plant during the last year to have been over \$144,362, divided as follows: Depreciation, \$30,771.80; interest and insurance, \$34,060; taxes, \$830.25; administration and generation, \$30,300; fuel, \$32,360; plant consumption, \$6,080; general transmission and distribution—job order, \$9,960.80. The total number of kilowatt hours generated was 8,321,200, at a cost of \$.01730 cents per kilowatt hour. The average cost of arc lamps per year was \$32.50. The average cost of multiple clusters was \$24.20 per standard; average cost of series clusters, \$23.15 a year; series tungsten lights, \$12.70 a year; arches, \$109.20

per arch. Receipts for the municipal light plant for the last year will amount to practically \$50,000, according to Superintendent Eichhorn. These receipts do not include the cost of lighting the city streets, but, if the plan now under way is carried out, the cost of street lighting as well as the lighting of all city buildings, will be charged against the city each year by the light plant. It is planned to have the city make an appropriation for illuminating purposes to pay the plant instead of making the appropriations for the light plant itself. The idea, Eichhorn says, is to place the plant on a self-sustaining basis, the same as the waterworks department.

Electric Lighting for All Duluth Streets.

Duluth, Minn.—Because it is calculated that electricity will be cheaper, the commissioners have ordered that electric arc lamps and incandescent light be installed in place of gas lamps and that the business with the gas company be discontinued. The resolution passed was introduced by Commissioner Merritt, head of the Department of Public Utilities, providing for the installation of eighty-four incandescent lights and twenty arc lights. Shortly after the voters of Duluth accepted the 6-cent lighting rate from the Duluth-Edison Company last January, Commissioner Merritt began negotiations with the Welsbach Company for a reduction in the rates of gas lighting. He claimed that the city could purchase electricity much cheaper under the new rate and that unless the gas rate was reduced he would discontinue the use of gas and replace it with electricity. The company refused to make a reduction and Commissioner Merritt immediately ordered a survey of the lighting system in Duluth. This survey shows that the city will save \$636 a year by using electricity in place of gas.

New "White Way" in Operation.

Tucson, Ariz.—Sixty five-light standards on one street form part of the new lighting system of the business section which has just been put into operation. Nitrogen lamps are used which are operated on a series circuit at 2,300 volts. The total cost of operation has been figured at \$1.15 per hour. The total cost of the new lighting system on the three streets will be \$23,000 when completed.

Municipal Plant Reduces Rates.

Mishawaka, Ind.—Mayor R. W. Gaylor announces that a reduction in rates for electric lighting is now in effect. The new schedule makes a reduction of about 10 per cent. in the rates heretofore charged. The platform on which the administration was elected called for an investigation of both gas and electric rates and a reduction in them if the investigation warranted such action. Mayor Gaylor, soon after taking office, ordered an investigation of the electric department and found that a complete inventory of the property of this department had never been made; that the system of bookkeeping and accounting was not up to date, resulting in the loss of many accounts, and that proper account of plant maintenance and depreciation had never been kept. Under the supervision of Supt. A. R. Klein a detailed inventory of all property of the electric department was made and special attention given to the questions of plant maintenance and depreciation. Under the system now in vogue in this department all purchases are made by the board of public works, through Supt. Klein, and all bills are approved by the board before payment is made. City Controller Walter Michael has established a new system of bookkeeping in the department.

MOTOR VEHICLES

New Apparatus Arrives.

Binghamton, N. Y.—The new fire apparatus has arrived and is in service. The combination chemical is equipped with chemical tank and hose, a box capable of carrying 1,000 feet of hose, ladders, axes and hand extinguishers. It is of the regulation maroon color, with scarlet wheels, and bears the number 6 in gold. This apparatus will be placed in commission at the Central Fire Station at once, replacing the Seagrave combination, which was the first piece of motor apparatus purchased by Bing-

hamton. The latter machine will be sent to the First Ward Fire Station when that building is completed. The hook and ladder truck, of Mack construction, is finished in maroon, with gold striping and scarlet wheels. It will be known as Truck 1, and will be located at the Central Fire Station. It has a total length of 37 feet and is equipped with a full complement of ladders, ranging from 16 to 50 feet. In addition it has a complete assortment of hooks, axes and hand extinguishers, and will carry a life net and other apparatus. The machines were made by the International Motor Car Co., Allentown, Pa.

New Truck Tested.

Gulfport, Miss.—The new Boyd fire truck has arrived in Gulfport and been subjected to a heavy sand test, which was said to satisfy the city officials. Fire Chief R. H. Hardtner was pleased with the performance of the new machine.

Complete Motorization.

West Springfield, Mass.—The complete motorization of the local fire department has been finished. A new light truck for emergency work and for Chief Elam B. Jones's use having been delivered. The new combination truck, which cost \$5,000, was delivered a few days later. West Springfield claims to be the first town in Massachusetts to replace all horse-drawn fire apparatus with motor vehicles. The work began seven years ago with the purchase of the Matheson trucks. Two years ago a larger combination truck was bought. At the annual town meeting this year an appropriation of \$5,000 was made to buy another big truck. The new light truck may easily be used in heavy work because of its power and of a delivery-wagon body which could carry 1,000 feet of hose if necessary. For ordinary purposes it will be equipped with apparatus to fight grass and brush fires and for repair work. Later a large chemical tank will be installed on the truck.

GOVERNMENT AND FINANCE

Iowa City Manager Legislation Passed.

Des Moines, Ia.—The McFarlane bill giving cities and towns the right to employ city managers to govern their affairs was passed by the house by a vote of 96 for to 6 against. It contemplates radical changes in the conduct of municipal government, but does not give cities any more powers than are now afforded them. Twenty-five per cent. of the electors of the city may cause the proposition to be submitted to the people upon petition. The same number, by petition, may cause the proposition of abandoning the plan to be submitted to the people.

City Manager Ousted.

Phoenix, Ariz.—City Manager W. A. Farish, tried on charges of incompetence, extravagance and inefficiency, has been removed from office by the commissioners. The commission has appointed Robert A. Craig to take his place and has given orders that he direct the city affairs. Farish however, has not accepted the decision of the commissioners and remains in full charge of the office and especially of the city treasury, and the new official has not been able to assume his duties. A writ of certiorari has been issued from the Supreme Court directing the commissioners to desist from further proceedings against Farish pending a review of the case. No payments are being made from the treasury. A recall petition has been started against Mayor Young and Commissioners Cope and Corpstein.

Hoboken's First Commission Election.

Hoboken, N. J.—In the first election under the commission form of government one of the commissioners won by one vote over Mayor Martin Cooke. The balloting was preferential and Mayor Cooke voted for the candidate who defeated him. The newly elected commissioners are restrained from taking office by a writ of certiorari, granted by Supreme Court Justice Swayze, to have the special election of February 9, at which the Walsh act was adopted, reviewed in court. The writ was granted at the request of City Treasurer James Smith. On February 8 at 9 o'clock

at night the legislature amended the Walsh act, changing the wording of the ballot for the election. It was impossible to conform to the new law in time for the election the following day, and the old form of ballots was used. A bill to correct this defect and legalize the election was passed by the legislature the following week. To protect himself the city treasurer has refused to turn over the city's money until the election has been declared valid by the courts. He caused the writ to be issued and also an injunction restraining City Clerk Londrigan from issuing any certificates of election until the election has been reviewed.

Tennessee Towns Commission Elections.

McMinnville, Tenn.—Efforts to elect a commission form of government at McMinnville failed by a vote of 249 to 124. There will be a continuation of the mayor and six aldermen.

Jackson, Tenn.—At a special election held here the voters of Jackson approved the proposed charter providing for a commission form of government by a vote of 779 to 419. By the provisions of the charter, Jackson is to elect three commissioners, who will take office June 1, 1915. The mayor will have supervision over the police and fire departments and will be final judge on all matters. He will receive a salary of \$2,500 per year. The commissioner of education will receive a salary of \$2,000, and commissioner of public utilities \$2,000.

Commission Form Rejected.

Avon, N. J.—By a vote of 72 to 57 Avon rejected commission government. The result was something of a surprise for recent turmoils in the council and squabbles over tax assessments had led some persons to believe that the present government would be rejected.

Charter Elections in North Carolina Cities.

Asheville, N. C.—Asheville adopted the commission form of government, giving the new charter a majority of 692 out of a total of 1,608 votes cast. On the question four years ago after a very bitter campaign, Asheville decided to retain the aldermanic system by a majority of 11 votes. Two years ago a bill providing for the commission form of government was not introduced in the legislature by reason of the inability of supporters of the movement to agree on the charter. In this election the administration was not attacked; supporters were fighting the system rather than the members of the city council. Chief opposition developed over those provisions of the enactment providing for the recall of the police judge, the abolition of the office of prosecutor of the police court, the discontinuance of the board of health and the abolition of the city school board.

Durham, N. C.—From a registration of over 1,300, 960 votes were cast in the charter election here and the new charter, providing for the appointment of a city manager, and election of city council of four aldermen and a mayor, voted down by a majority of 92, 433 votes to 525. The city employees lined up against the adoption of the new charter almost to a man; and so did the majority of the politicians of the city. Mayor Brogden approved the proposed charter, but declared the present charter had ample provision for the election of city manager, which he advocated.

Vote for Charter Revision.

Grand Rapids, Mich.—By their votes at the primaries the citizens have declared for a general revision of the city charter. The vote stood: Yes, 7,761; no, 5,019. The vote calls for the election of a charter commission at the April 5 election. One member of the charter commission will be elected from each ward and three at large. According to the provisions of the election any qualified elector residing in Grand Rapids may become a candidate for this commission, but city officers or employees, whether elected or appointed, are barred. Candidates are to circulate petitions the same as when running for city office, and 50 signatures from each ward will be necessary on each petition. For

commissioner-at-large 50 signatures from each ward, or 600 in all, are necessary. The candidate receiving the highest number of votes in his ward will be declared elected. The commissioners-at-large will be elected by the same method, the three receiving the highest vote being named.

New Charter Signed.

Rensselaer, N. Y.—The signing of the revised city charter by Governor Whitman places the city under a new and simpler constitution. It abolishes several commissions and reduces the salaries of a number of officials. The board of estimate and apportionment, the education commission and the board of plumbers are abolished, as is also the office of commissioner of public safety, salary \$900 a year. The affairs of the city under the new charter will be conducted by three boards, the common council, board of public safety and board of education. The common council will have all contracting powers, auditing of all bills and exercise of all municipal functions, except as to education, with which the board of education is vested, as recommended by the state education department for cities of the third class, and which is composed of a board of five members who are to serve without pay, and the superintendent of schools to act as clerk of said board without additional compensation. The board of public safety is created, composed of the mayor, city treasurer and city clerk, the city clerk to be clerk thereof; this board will have the regulating and government of the police, fire and health departments, and to exercise all the powers exercised by the examining board of plumbers. The library commission is abolished and the board of education will exercise all the powers of the commission. The appointment of city officers will be made by the mayor without confirmation by the common council.

STREET CLEANING AND REFUSE DISPOSAL

Clean-Up Successful.

Baltimore, Md.—It is estimated by the street cleaning department that between 15,000 and 16,000 cartloads of refuse were collected during the clean-city crusade, according to Street-Cleaning Commissioner Larkins. About 700 men forming an emergency force, suggested by Mayor Preston, were employed, each working three days a week at \$2 per day.

Wilmington, N. C.—With 642 loads of rubbish and trash removed from the streets during the past week, Superintendent John C. McAllister announces that the first week of the clean-up was a success. The original plan was to continue the campaign for two weeks, as it was realized that it would be impossible to complete the work in one week. An added feature this year has been the paint-up campaign which has proven very successful.

New York's Garbage Legislation Vetoed.

New York, N. Y.—Gov. Whitman has vetoed the Lockwood-Perlman bill giving the Street Cleaning Commissioner power to contract for a period of fifteen years with any person, firm or corporation for the equipment, maintenance and operation of a plant for the final disposal of garbage and refuse, which ostensibly would have been constructed at the expense of the City of New York. The bill was presented to the legislature on behalf of Mayor Mitchel. For the last three years the New York City authorities have sought at the hand of the lawmakers the power granted in the Lockwood-Perlman bill. The bill was passed in both houses by a party vote this year. Gov. Whitman, in his veto message, asserted that with its credit impaired to the extent it was at present, the City of New York should not be permitted to commit itself to anything like the municipal undertaking contemplated by the bill. It was, said the Governor, clearly brought out that the city's refuse is a valuable commodity, and that the city is to-day capable of developing a considerable annual revenue from the sale of refuse and garbage. The city should not dispense with any income-producing activity which it may at present command, or carry further the principle of

private participation in revenues that are essentially public in character.

Mayor Mitchel was greatly surprised at the veto and said it would cost the city \$1,400,000. Under the present law the Street Cleaning Department may either construct a final disposition plant on city land and operate it, or make a contract with a private person for final disposition on private property, but that contract cannot be for longer than five years. Under the proposed law the department, in addition to the two methods mentioned, would have a right, first, to construct on city land a plant to be privately operated under a sharing of proceeds contract, the contractor to furnish all equipment and to operate and the city to furnish buildings and fixed structures; or, second, the plant could be constructed on private land with private capital, to be operated on a profit-sharing basis with the city. When read in connection with existing laws, this law would have offered still another method by permitting the operation of a private plant on property leased by the city to the contractor, the profits to be shared in a ratio to be determined by the Board of Estimate.

"Clean-Up" Campaigns Begin.

Milwaukee, Wis.—The dates, April 18 to 24, have been set for Milwaukee's second annual paint-up and clean-up campaign, and every effort will be made to make the brightening up process more effective this year and its results more lasting. M. C. Rotler has been elected to the presidency of the Milwaukee paint-up and clean-up bureau.

Racine, Wis.—A "clean-up day," to take place on May 1, is being planned by the local health board. The plan is to have the city hire men and wagons and remove this rubbish to the garbage plant. Married men out of work and those on the poor list will be given the preference for the jobs.

Maryville, Mo.—Maryville will receive its initial clean-up on April 20, according to the announcement of a special clean-up committee recently appointed. The city wagons will remove all rubbish, except cinders and brush, tree tops and other bulky trash, Mayor U. S. Wright and John H. Gray, councilman, members of the committee, announced.

Marion, O.—The week of April 19 has been set for clean-up week in the city, Mayor Brockett announces. The city will have wagons to make trips through the alleys to gather up the rubbish. A charge of 15 cents will be made for the first barrel and 10 cents for each succeeding barrel.

RAPID TRANSIT

Experts Report on Detroit Traffic Conditions.

Detroit, Mich.—An exhaustive study of traffic conditions is contained in the report of Barclay Parsons & Klapp, traffic experts, presented to the street car board by Engineer H. M. Brinckerhoff. This report, promising a reduction of from 50 to 75 per cent in car crossings in the congested district, and an increase in passenger capacity of from 30 to 50 per cent by applying common sense routings and scientific operation, constitutes a harsh indictment of the railroad company. The survey cost \$35,000. The recommendations are in three groups, Group A calling for \$400,000 expenditure without the outer extensions. Some of the propositions are: The entire re-routing of the various lines entering the heart of the city by a system of loops at the core; two-car units (the trailer system, or double motor as an alternative), on Woodward avenue during rush hours in group B, for immediate adoption without track change or litigation are proposed: A system of skip-stops in the congested district; street collectors for front doors in congested district; removal of division rail between entry and exit doors on rear platform at heavy loading points, and use of both doors at such times for loading; operating of special cars through factory crowds at loading times to care for general travel at points lower down; enforcement of traffic ordinance against parking, especially at loading points, and re-routing. Group

C, subway recommendations include: A short subway loop for congested district to cost \$2,500,000, for relief of congestion that will again follow growth—this would be a means of relief, not a source of revenue and could be made the starting point of future long subway; a long subway system which would not be self-supporting until city has 1,000,000 people and then only at higher than 5-cent fare and which would cost \$16,300,000.

Pass Jitney Ordinance Over Mayor's Veto.

Los Angeles, Cal.—Over the veto of Mayor H. H. Rose the city council has unanimously adopted the jitney bus ordinance. The ordinance provides that drivers of jitney buses shall post an indemnity bond of \$5,000 to protect passengers in case of accident. Mayor Rose vetoed the ordinance, suggesting a \$10,000 instead of a \$5,000 bond. He also wanted the busses kept off the principal business streets.

Jitney Connection for Municipal Railway.

San Francisco, Cal.—The public utilities committee of the board of supervisors has accepted the proposal of the Mathewson Motor Company to run jitney busses at the beach. These will connect with the Geary Street Municipal Railway at its beach terminus. The fare on the auto busses will be 5 cents. Transfers will be exchanged between this bus line and the Municipal Railway. Supervisor Vogel-sang, chairman of the committee, has prepared a draft of an ordinance to regulate jitney busses.

The Alien Labor Law and the New York Subway.

New York, N. Y.—In view of the amendment of the Labor Law, the Public Service Commission for the First District has adopted a resolution directing counsel to prepare modifications of all existing rapid transit contracts in conformity with the amended statute. These contracts contain a provision binding the contractor to carry out the provisions of Section 14 of the Labor Law, which formerly provided that none but citizens of the United States shall be employed upon public work or contracts let for public work. The law, as amended, provides that citizens shall be given preference, but that aliens may be employed when citizens are not available. The amendment also authorizes a modification of existing contracts in conformity with the new provisions.

London Motor Busses Rival Tramways.

London, England.—London omnibuses carried nearly 734,000,000 passengers during the year 1913. This is nearly twice as many as were carried in 1910 and is 90 per cent. as many as were carried by the street cars. It is also nearly 60 per cent. more than were hauled by the local steam railroads. The exact figures for 1910 and 1913, as given in the report of the London Traffic Branch of the Board of Trade for 1914, recently issued, are:

	1910	1913
Street cars.....	763,797,856	811,397,317
Omnibuses	377,207,555	733,931,201
Steam roads	425,271,861	462,019,537

Of the 3,644 omnibuses licensed in 1913 only 142 were horse-drawn. There were only 28 more busses licensed in 1913 than in 1903, when there were but 13 motor busses, yet they carried more than 2½ times as many passengers. At the same time the motor busses serve a much greater mileage than the old horse busses, the length of road traversed having increased from 195 miles in 1912 to 528 miles in June, 1914. Many bus routes are now from 15 to 20 miles in length. Although more than 50,000,000 passengers were carried by cabs in 1913, the number of these vehicles was reduced from 11,000 horse-cabs in 1903 to 10,320 cabs in 1913, of which 8,387 were motor driven. With regard to accidents caused by motor busses, the report says: "In proportion to the work done by these vehicles, their fatal effect has largely decreased. It is not sufficient merely to take the actual number of accidents caused; consideration must also be given to the number of vehicles in each class and the amount of mileage run."

LEGAL NEWS

A Summary and Notes of Recent Decisions— Rulings of Interest to Municipalities

Streets—Rights of Abutting Owners.

Spencer v. Levy et al.—A right to the unobstructed use of streets is appurtenant to the right of possession of the adjoining land, and hence the right of the possessor to use the streets is not dependent on proof of title to such adjoining land in fee.—Court of Civil Appeals of Texas, Austin, 173 S. W. R., 550.

Public Improvements—Sewers—Outlet.

City of North Chicago v. Cummings et al.—Where an ordinance for the construction of a city sewer so described it that its outlet was located in a natural water course of sufficient capacity to carry off the water, and there was no objection that the city had no right to drain the water into such water course, an objection that the ordinance did not provide an outlet for the sewer was unsustainable.—Supreme Court of Illinois, 107 N. E. R., 776.

Improvements—Right to Require Bond.

Southern Surety Co. v. Waits.—The officers of a municipal corporation are authorized by section 3881, Rev. Laws 1910, to require from any person or persons entering into a contract for the purpose of making public improvements a bond with good and sufficient sureties, conditioned that such contractor or contractors shall pay all indebtedness incurred for labor or material in making said public improvements.—Supreme Court of Oklahoma, 146 P. R., 431.

Taxes—Exemption—Validity.

Point Pleasant Waterworks Co. v. Mayor and Council of Borough of Point Pleasant Beach et al.—An ordinance authorizing a water company to lay water pipes in public streets and requiring it to furnish to the borough a supply of water free of charge for the use of public buildings, etc., and exempting it from taxation by the borough during its franchise, and a contract pursuant thereto exempting it from taxation, in view of the want of connection between the amount of the tax and the value of the water to be supplied, and in the absence of any legislative authority therefor, were invalid.—Supreme Court of New Jersey, 93 A. R., 94.

Officers—Retirement on Pension—"Removal from Office"— "Transfer."

Cliff, Mayor, v. Wentworth et al., Justices of Police Court.—St. 1911, c. 624, authorizing a person removed from an office, lowered in rank or compensation, or suspended, or without his consent transferred to any other, to present a petition in the police court for a review, applies to retirement of a police officer on pension of one-half of his compensation, for the retirement on a pension is a "removal," or, if not a removal, a "transfer" and reduction of compensation, and the police court has jurisdiction on the petition of the officer to review the action.—Supreme Judicial Court of Massachusetts, 107 N. E. R., 937.

Public Improvements—Bonds—Order of Election— Validity.

Connolly v. Beason et al.—Where freeholders petitioned a town council for an election on the issuance of bonds for the "construction" of waterworks and sewerage systems, the order for an election on the issuance of bonds for the "construction and maintenance" of such systems was not such a variance between the petition and the submission as affected the validity of the bonds, but went only to the application of the proceeds of the bonds, and the freeholders could not complain, unless the council should apply the proceeds to a different purpose, and the voters could not complain, since they authorized the application of the proceeds to both purposes, and necessarily vested in the council discretion to use the whole for the purpose of construction, if it saw fit to do so.—Supreme Court of South Carolina, 84 S. E. R., 297.

NEWS OF THE SOCIETIES

Calendar of Meetings.

April 8-10.
MONTANA SOCIETY OF ENGINEERS.—Annual Convention, Butte, Mont.
May 10-14.
AMERICAN WATERWORKS ASSOCIATION.—Annual Convention Cincinnati, O. Secretary, J. M. Diven, 47 State street, Troy, N. Y.
May 25-28.
INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE.—Cincinnati, O. F. J. Cassada, secretary-treasurer.
June 2-4.
SOUTHERN GAS ASSOCIATION.—Hotel Isle of Palms, Charleston, S. C.
June 14-16.
SOUTHWESTERN WATERWORKS ASSOCIATION.—Annual Convention, Galveston, Tex. Secretary, F. L. Fulkerson, Waco, Tex.
June 16-19.
TRI-STATE WATER AND LIGHT ASSOCIATION of the Carolinas and Georgia.—Annual Convention, Asheville, N. C. President, F. C. Wyse, Columbia, S. C. Convention Manager, W. F. Stieglitz, Columbia, S. C.
June 22.
MAYORS' ASSOCIATION OF CONNECTICUT.—Bridgeport, Conn.
Aug. 2-6.
GOOD ROADS CONGRESS.—San Francisco, Cal., under the auspices of the Tri-State Good Road Association.
Aug. 31-Sept. 3.
INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.—Annual Convention, Cincinnati, O.
September 20-25.
INTERNATIONAL ENGINEERING CONGRESS.—Am. Soc. C. E., Am. Inst. Min. E., Am. Soc. Mech. E., Am. Inst. E. E. and Soc. N. A. & M. E., San Francisco, Cal. Secretary, W. A. Catell, Foxcroft Building, San Francisco, Cal.

International Association of Fire Engineers.

The executive board of the International Association of Fire Engineers met at the Hotel Sinton, Cincinnati, O., March 23, to arrange for the annual convention of the organization, which will be held in that city from August 31 to September 3. The following is a list of the officials who were present:

President, Hugo R. Delfs, of the Lansing (Mich.) department; secretary, James McFall, of Roanoke, Va.; board members, C. W. Ringer, of Minneapolis, Minn.; John H. Kratz, of Manitowoc, Wis.; Otto F. Utz, of Niagara Falls, N. Y., and William H. Bywater, of Salt Lake City, Utah.

Florida State Good Roads Association.

The Florida State Good Roads Association was held at St. Petersburg, Florida, March 24 and 25. F. O. Miller, of Jacksonville, was elected president; J. P. Clarkson, secretary, and J. D. Rooney, treasurer. The board of governors will hold over and is empowered to fill any vacancies now existing or which may occur. St. Augustine was selected as the meeting place for the 1916 convention.

Strong resolutions endorsing a bill providing for a state highway department and a state highway commissioner were adopted by the association at the morning session of the convention March 25.

The draft of the bill was reported by Judge H. B. Phillips, of Duval county, chairman of the legislative committee of the organization, and by a unanimous vote its passage by the legislature was recommended by the delegates assembled at the convention. The

bill provides that the state highway department shall consist of five members to be appointed by the governor. Each of the four congressional districts of the state is to have one member and the fifth will represent the state at large. They are to serve without compensation, but actual reasonable expenses incurred in performance of their duties will be paid. They shall employ a competent and efficient road builder well versed in the building of good roads, who shall be known as the state highway commissioner. They may also employ assistants to the commissioner and such clerical help as necessary.

The headquarters and office of the state highway department shall be located at the University of Florida, in Gainesville. The department shall collect data and information as to all roads in the state and have maps and plates thereof made; also data as to the best methods and material for road building and repair in the different localities in the state, and furnish the same free to the county commissioners of the several counties.

The highway commissioner or assistant shall as often as practicable visit the several counties and inspect the roads and methods of construction and repair and materials used in building roads and make report to the department. County commissioners are required to file with the department quarterly reports of all road construction and repair work. Whenever requested by the commissioners of any county the department shall send the highway commissioner to such county to give advice and assistance in construction and repair of roads, without expense to the county except actual traveling expenses.

The department must render reports to the governor making recommendations as to changes needed in road laws. In case of federal aid being granted for construction of roads, such funds shall be expended under supervision of the department.

The amount of money to be appropriated annually to carry out the provisions of the proposed act is left blank and is to be inserted when the bill is introduced in the legislature.

Michigan Good Roads Convention.

The following officers were elected at the annual meeting of the Michigan Good Roads Association held March 9-12, at Grand Rapids: Philip T. Colgrove, president; N. P. Hull, vice-president; R. A. Anderson, secretary; Edward Roe, treasurer.

President Colgrove reappointed his entire board of trustees, with the exception of Arthur P. Loomis of Ionia, who is succeeded by John N. Lentz of Monroe. The present board consists of Roy D. Chapin, Detroit; Alvah W. Brown, Grand Rapids; W. K. Prudden, Lansing; John N. Lentz, Monroe; Dr.

George F. Young, South Haven; A. H. Dudley, Jonesville; Frank Hamilton, Traverse City; W. M. Bryant, Kalamazoo; Charles Farrin, Mt. Clements, and C. E. Parmerlee, Lapeer.

Indiana Gas Association.

The following officers were elected by the Indiana Gas Association at the close of the seventh annual meeting held at Indianapolis March 12: J. H. Maxon, of Muncie, president; G. M. Dolley, of Logansport, vice-president; James W. Durbar, of New Albany, secretary and treasurer; S. E. Mulholland of Ft. Wayne, Ray Ziegler of Muncie, E. J. Burke of Indianapolis, and T. A. Elder of Indianapolis, directors. J. D. Forrest, general manager of the Citizens Gas Company, read a paper on "Application of By-Product Coke Ovens to the Gas Industry."

Boston Society of Civil Engineers.

At the annual meeting of the Boston Society of Civil Engineers March 17, Joseph R. Worcester, consulting engineer, was awarded the Desmond Fitzgerald medal, as being the author of the best paper presented before the society during the year. The paper was an exhaustive study of Boston Foundations. The following new officers have been elected: President, Charles R. Gow; vice-president, Ralph E. Curtis; secretary S. Everett Tinkham; treasurer, Frank O. Whitney; directors, Prof. George C. Whipple, Edmund M. Blake. The new president is a general contractor and is chairman of the Boston Licensing Board. Following speaking by the officers-elect, F. H. Newell, Washington, D. C., consulting engineer of the United States Reclamation Service, gave an illustrated address on "Engineering and Economic Advantages Obtained by the Reclamation Service."

The society celebrated the acquisition of new members, the membership now exceeding 1,000.

Municipal Exhibit at Mayor's Meeting.

A municipal exhibit, the first of its kind in New York State, will be one of the features of the sixth annual meeting of the New York State Conference of Mayors and Other City Officials to be held at Troy on June 1, 2 and 3.

The exhibit will consist of implements and manufactured wares most commonly used and purchased by municipalities. Mayor Cornelius F. Burns, of Troy, has appointed a local committee to have charge of the exhibit and act for the Conference. The exhibit will be held in the large drill shed of the Armory. Plans are being made so that the large apparatus may be easily removed to the street for demonstration purposes.

The Conference is planning to make the exhibit attractive not only to the visiting officials, but also to the people living in the ten nearby cities connected with Troy by trolley. All of the

(Continued on page 452.)

HIGHWAY EQUIPMENT AND MATERIALS

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

MIXERS AND PAVERS.

Jaeger "Big-an-Little" and Paver Concrete Mixers.

The drum of the 1915 Jaeger mixers consists of a semi-steel bowl which forms the lower half and a steel cone the top. This bowl differs from all others and from that of the former Jaeger drums in that it has two flat plates on opposite sides which cause an entirely different movement of the material, these flat spots helping to bring material from the bottom forward while the cone part carries it back. With the combination of this novel shaped bottom half, the cone and the arrangement of flows it is claimed that the mix is thorough and rapid. The drum rests on the yoke and revolves around the axis, which is held by the yoke at an angle. It is pivoted in such a way that it balances when charged, making it easy to discharge by tilting. The drum cleans itself with the discharge of each batch. The discharge is easily controlled when dumping into wheelbarrows or dumping may be done directly into the forms.

The drum is rotated from the drive pinion, which has its bearing in the center of one end of the yoke, making it possible to discharge the drum while it is being revolved. The engine drives the pinion through gears—there is no sprocket chain in the machine.

This type of drum, which is here illustrated, is used in the whole range

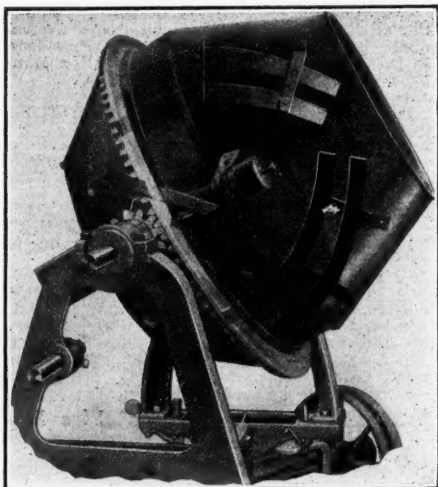
of Jaeger mixers. The Jaeger "Big-an-Little" is a batch mixer of medium size, taking from 5 to 6 cubic feet of loose material or a capacity of 60 or 75 cubic feet daily. The frame is of iron and steel and the wheel tires very wide. There is a gear arrangement for dumping the batch. The mixer may also be had without the engine. A hoist may be combined with the outfit. This is of the quick action type, directly connected to the engine, and consists of two standards supporting the drum and main gear. The driving pinion is attached to the friction drive and this to the engine. On regular outfits, using a 3 h. p. engine, the hoist lifts 400 lbs. easily over a single block at about 60 to 80 feet a minute. The mixer may be equipped with a loader. This is built of steel and is operated by the regular hoist. Its capacity is in proportion to one batch for six cubic feet and its large discharge end allows it to unload quickly. The loader about doubles the output. It may be controlled from either end. A double hoist may be obtained also. The mixer may be had with crosswise trucks or skids.

The Jaeger "Big Mixer" has a capacity of 10 cubic feet and is calculated to do the heaviest work. It has a 5 h. p. gasoline engine, hopper cooled, make-and-break type, steel housed. It is equipped with loader and automatic water supply.

The Jaeger "Little Mixer" has a capacity of 3 cubic feet per batch and is

equipped with a $1\frac{3}{4}$ h. p. engine. It is durably built and has the same qualities as the larger mixers.

The Jaeger paver is a complete mixer, having a capacity of 10 cubic feet per batch. The loader bucket is large and with open end. The water is supplied by automatic water tank. Discharge is by gear. Traction is both ways and corners may be turned without trouble and there is a useful brake,



DRUM OF JAEGER MIXERS.

steering being done by lever. The paver is equipped with a collapsible delivery chute, 10 feet long which swings easily on a pivot. It is operated by one man. It takes about 2 or 3 gallons of gasoline per 10-hour day.

These mixers are made by the Jaeger Machine Co., Columbus, Ohio.

CRUSHED ROCK HANDLING.

Gyratory Crusher and Pulsating Screen.

The Bronze Ball Gyratory Crusher.

In the Bronze Ball gyratory stone crusher, built on the principle of the ball and socket eccentric, a hopper encircles the upper end of the top shell and a long-armed spider, cast in one piece, is bolted securely to the shell. The crushing head is fastened to the main shaft suspended at the point of least gyration. The lower shell, forming a base for the machine, is bolted to the upper shell. In the lower plate is cored a cylindrical cavity finished to receive the sleeve which carries the ball and socket eccentric, the cavity also acting as in oil reservoir. A spout with a removable lining is provided for chuting the stone at an angle of about 40 degrees from where it drops below the crushing head and slides through an opening in the side of the bottom shell into the elevator or bin.

The top shell is a massive, annular,

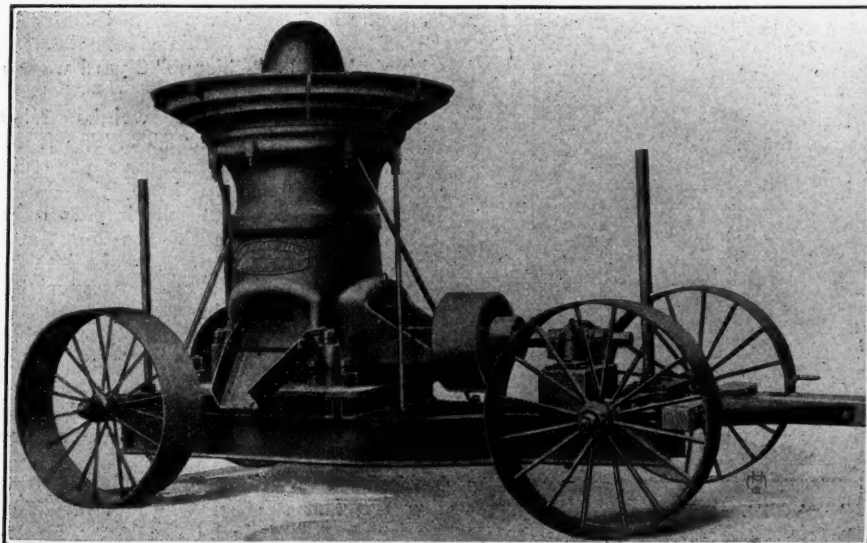


JAEGER PAVES.

close grain casting and the concaves are of either chilled iron or manganese steel. The bolt holes are so spaced that the top shell may be turned in order to have the spider at the most convenient point for receiving the rock. The main shaft is suspended in the spider by means of a nut which is secured in position by a steel key and which rests on a steel suspension ring which in turn rests on a steel wearing ring. The shaft is of open hearth steel. The method of support of the shaft eliminates excessive friction. The crushing head is rigidly secured to the main shaft and is made of

one directly under the head and a double packed one above the eccentric. The countershaft is equipped with a special long bearing next to the gear and an outboard bearing to eliminate undue strain.

The crusher is made in a number of sizes varying from one with a capacity of 10 to 20 tons per hour of 1¼-inch product, weighing 15,500 pounds and needing 10 to 15 horsepower, to one with a capacity of 300 to 700 tons per hour of 5-inch product weighing 210,000 pounds and requiring 125 to 175 horsepower. The illustration shows the smaller sizes in portable form



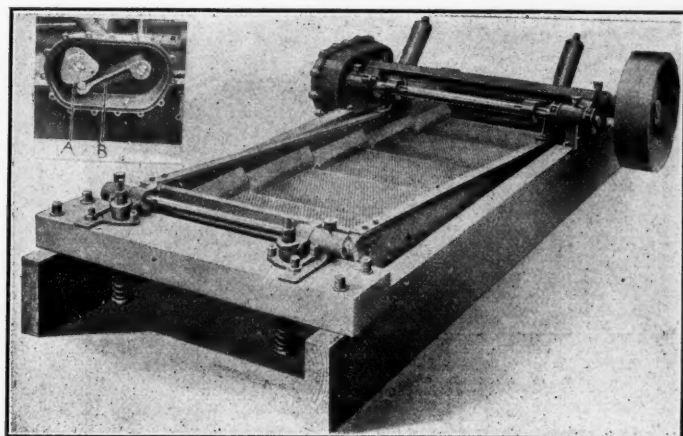
PORTABLE BRONZE BALL GYRATORY CRUSHER.

chilled iron for soft rock or manganese steel for the harder material. The bottom shell is a massive casting, heavily ribbed at the bottom with an opening in the center through which the main shaft passes. The discharge chute is covered with heavy chilled iron wearing plates, easily removable, which protect the shell. The bevel gear and pinion are made of cast steel. The gear is detachable. The eccentric is made with a bronze ball which compensates for the changes in the inclination of the main shaft. The eccentric has a large area of contact and is enclosed in a heavy casting with a cast iron bushing. The crusher is provided with two dust collars: a single packed

mounted on a channel iron frame which, by means of long threaded rods, is lowered so as to rest on a foundation of timbers or rocks when in operation.

Symons Pulsating Screen.

The Symons pulsating screen has the weight of the screen body carried on four coil springs which are compressed as the screen is forced down and back. With the sudden release the springs move up and forward imparting this movement to the material. The stone particles are thrown out of the screen openings or pass through. The screen



SYMONS PULSATING SCREEN.

body is swung on two shafts by four hanger arms. The pressure in the bearings is confined to one side only so that the whole runs smooth. The revolution of cam A (shown in the small insert) forces back lever arm B carrying the screen downward and backward. The cam is so shaped as to allow abrupt release so that the screen is quickly tossed. The lever arm is provided with a wearing piece which may be easily replaced. The cam and lever arm operate in a dust-proof oil box. The perforated plate or wire cloth is arranged in sections attached in such a manner to the steel sides of the body as to be easily removable. The screen sections are set level and arranged in steps. The screen is held taut. An automatic feed may be had. The standard sizes of the screen are 24, 36 and 48 inches wide and 5 feet 3, 7 feet, 8 feet 9, 10 feet 6 and 12 feet 3 inches long.

The crusher and screen shown in the accompanying cuts are both made by Chalmers and Williams, Inc., Chicago Heights, Ill.

TRACTOR TRUCK.

Allis-Chalmers Machine with Wide Range of Uses.

The Allis-Chalmers tractor-truck has been developed to serve in two capacities—as a tractor for general hauling purposes and as a truck for hauling on poor roads. As a truck the equipment has a capacity of five tons; as a tractor the drawbar pull at first speed is 9,000 lbs.; on second speed, 4,125 lbs.; and at third speed, 2,370 lbs. The machine is not recommended for use as a tractor on the fourth speed. Its first speed forward is 1½ miles per hour; second speed, 3½ miles; third speed, 6 miles, and the fourth speed 8 to 10 miles per hour; the reverse speed is 11-13 miles per hour. The fourth speed is recommended only for light loads and emergency purposes.

The tractor-truck is equipped with a 4-cylinder T-head, automobile type engine, developing 68 h. p. at 1,000 r.p.m. It is water cooled, positive circulation with centrifugal pump. The radiator is of the square tube type,



TRACTOR-TRUCK.

with belt driven fan. The carburetor is of the automatic float type with water jacket for warm water and air inlet shut-off for starting in cold weather; it has the gravity feed.

Auto truck practice has been very closely followed in the rest of the equipment, the clutch being large cone leather faced with adjustable spring inserts underneath leather, allowing gradual engagement. There is a full universal between clutch and transmission, also Spicer joints on drive between the transmission and differential. The transmission, differential and jack shaft are in one unit,

by roller chain. The entire weight carried by the track wheel is supported on chain connected rollers, eliminating journal friction at this point. At the rear axle there are two semi-elliptic springs and two coil springs on the front axle; foot brake is equalized, contracting on drums connected to countershaft. The steering gear consists of worm and double nut with very large bearing surface and the wheel pivots turn on Timken roller bearings. The wheel is 20-inch. The main frame consists of 7-inch rolled steel channel section, extra heavy and heavily trussed with angle steel sub-frame; the cast-

plates which keep the front gear in proper position at all times. The pole is stiff and is equipped with breast chains.

The dumping and winding mechanism is simple and accurate, accidental dumping being claimed to be impossible. Practically all the parts are made of wrought iron. By adjusting the chain in grab hooks the load can be spread as desired, thus making it unnecessary to carry an extra chain. The doors are easily closed by hand lever.

In the light wagon, the body is $1\frac{3}{8}$ inches thick and the weight 2,100 pounds. An extra $\frac{1}{2}$ yard top box may be had to make a 2 yard capacity. The front gear for this wagon has no kingbolt. The "Chicago" 2 yard wagon has a $1\frac{1}{2}$ inch body and the 3 yard a $1\frac{3}{8}$. The former weighs 2,400 pounds and the larger 2,900. The front gear for these wagons have patented oscillating plates to keep the body level when the front wheels pass over rough roads. The hinges in these wagons extend across the full width of the bottom and are made of specially refined wrought iron. One bottom door overlaps the other preventing leakage. A patented equalizing device distributes the weight of the load equally to each chain. Special axles with bearings may be had to reduce draught.

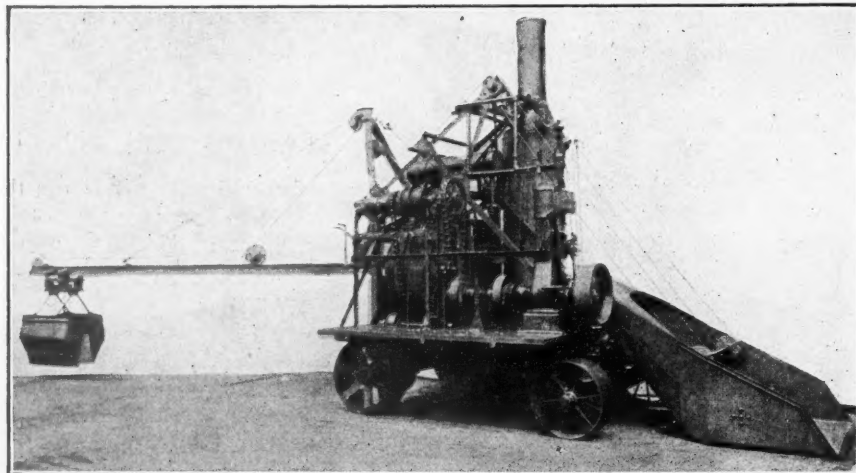
The illustrations show the 3 yard wagon and the dumping device. The wagons are made by the Peter Schuttler Co., 22d street and Rockwell avenue, Chicago, Ill.

INTERNATIONAL CONCRETE MIXER.

With Worm and Chain Drive.

At the recent Good Roads Show and Cement Show in Chicago was shown the new 1915 model "International" street paver. The principal feature of this mixer is the use of chain and worm drive, not a gear being used—gear troubles being thus eliminated.

The traction is worm drive, encased in oil. The driving truck wheels are made of cast semi-steel, 32 inches in diameter, and the front wheels are



"INTERNATIONAL" PAVER.

extra heavy; the sliding gear, selective type, with four speeds forward and reverse, direct drives on third speed; the bearings are F. & S. annular ball; the gears are chrome vanadium steel. The differential is of large size and made of chrome vanadium steel; pinion shaft supplied with two Timken bearings and there are also Timken bearings on the differential. The final drive consists of special alloy steel sprockets on jack shaft and track wheel connected by side roller chains of extra heavy type. The treads of the track wheel form an endless chain which runs over two steel sprockets, the rear sprocket being keyed to the same shaft as the sprocket driven

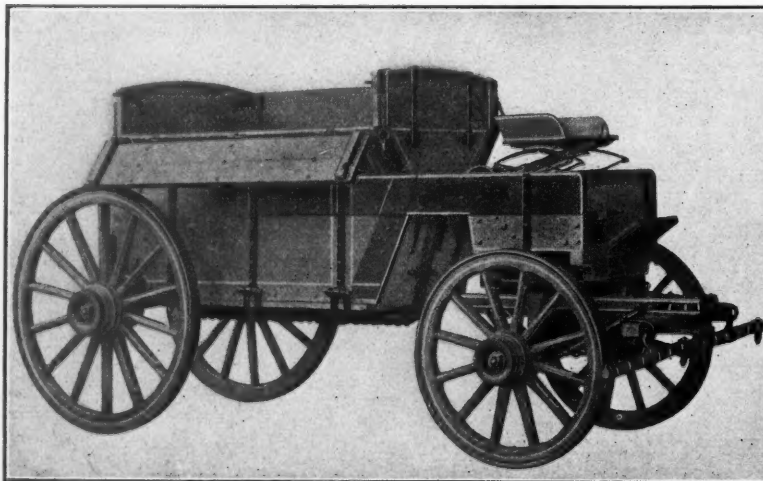
ings are chrome vanadium, annealed and heat treated.

This tractor-truck, shown on a difficult grade in the accompanying illustration, is made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis.

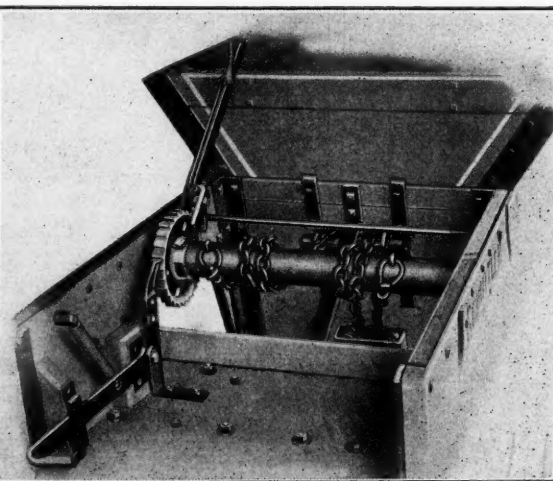
SCHUTTLE DUMP WAGONS.

1½, 2 and 3 Yard Sizes.

The Schuttler Dump Wagons are made in three sizes with capacities of $1\frac{1}{2}$, 2 and 3 cubic yards. The wagons are made of clear white oak, thoroughly seasoned by air-drying and carefully ironed and braced. The gear is full cut under so the wagon may be turned in its own length. The wagon is equipped with interlocking center



"CHICAGO" DUMP WAGON.



DUMPING ARRANGEMENT.

made of steel, 28 inches in diameter. The power steering apparatus is operated by a worm drive in connection with bevel frictions, so that hand steering is eliminated.

The conveyor carrying the distributing bucket is roller bearing, encased in grease. The bucket opens wide like a clam shell, discharging immediately. It travels on a channel boom made of two sections of channels and is operated by bevel frictions, positively tripping at any point and automatically closing on return to the mixer.

The winding drum is of the self-oiling type, requiring oiling once a season. The tracker wheels are of the same oiling device, a cellar or reservoir being cast in the center of the wheel holding enough oil to last two weeks to a month.

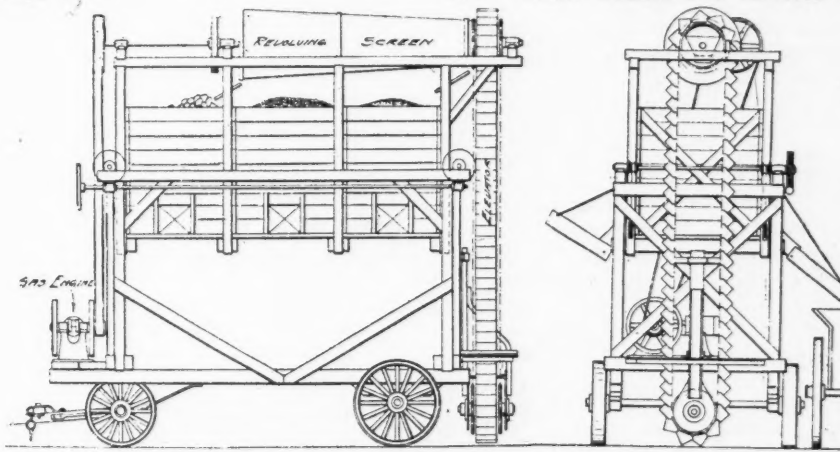
The drum is made of two semi-steel castings, in which is shrunk and pinned a steel band to the cast metal drum for tracker surfaces. The open end loader is of the latest design and is wide enough to admit two wheelbarrows at the same time. There is a bumper and the loader enters a sub-chute, so that loading is easy. The distributing chute is of the gravity type and may be had any length desired. This is designed for use on highway work where the pavement is not over 20 feet wide. The operator stands on one side of the machine and all the handles are so arranged in line with plenty of leverage for easy operation. The water tank is of the pressure type and may be readily adjusted to give a required amount of water.

The frame is built of extra-heavy channels and angles, with a steel squaring plate covering the whole frame; the traction drive and power steering apparatus are the only parts underneath the frame and are fully protected. Both of the worms are covered with a cast steel housing, encased in oil.

The mixer has a capacity of 14 cubic feet of loose material per batch and 12 cubic feet of mixed material, so that it can produce up to 25 cubic feet per

day. The engine is 9 horsepower and the boiler 12; the gasoline engine is 10 horsepower. The total weight of the mixer is 12,000 pounds; of the boom, 2,000, and of the bucket, 600.

The "International" paver, shown with full equipment in the illustration, is made by the Power & Mining Machinery Co., Milwaukee, Wis., for the "International" Concrete Mixers, Cudahy, Wis.



STEPHENS-ADAMSON PORTABLE GRAVEL PLANT.

GRAVEL AND SAND PLANTS.

Stationary and Portable Screening and Washing Plants.

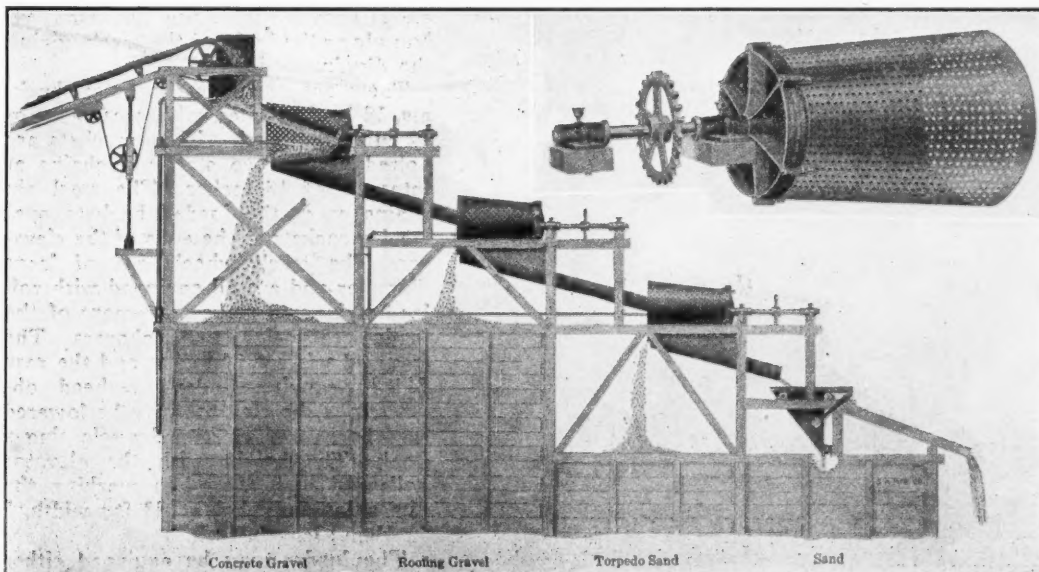
The Gilbert screen used in the Stephens-Adamson gravel plants is conical in shape, entirely open at one end and supported on a horizontal axis. A chute delivers the gravel and water to the extreme interior of the screen and the material agitated by the revolving screen works its way out against a jet of water and is thoroughly washed. A series of these screens, arrayed as shown in the illustration, and used in connection with an "S-A" automatic settling tank, forms a washing and screening plant. The example shown is for producing three sizes of gravel and one of sand. The material is delivered into the hopper at the left by the "S-A" belt conveyor. This conveyor frequently operates in conjunc-

tion with a portable field conveyor, equipped with a movable hopper which receives from a steam shovel, drag line or scrapers. The gravel falls into the chute below the hopper and is there met by a stream of water which washes it into the first screen, which rejects the largest size of gravel. As the gravel works its way to the large end of the screen it is again met by a stream of water which washes and tumbles the

small stones, forcing the fine materials through the perforations. This process is repeated in the other screens, each time rejecting a finer product. The settling tank at the right allows the water containing the clay and loam to pass off through the overflow. The clear sand passes through the gate at the bottom into the bin. The first oversize may be sent to a crusher and then back to the screens.

The "S-A" automatic settling tank handles the water rejected by the screens and which carries in suspension a large proportion of fine sand as well as clay and loam. This water is discharged into the settling tank at one side and flows from the opposite side in a continuous stream. Meanwhile, the heavier particles of sand naturally settle to the bottom while the lower specific gravity of the particles of clay and loam holds them in suspension and they pass off with the water. As the sand accumulates, the added weight of the tank causes a valve to open and sand flows to the bin until the weight is sufficiently reduced to allow the valve to close again, this cycle being repeated. The tank is constructed entirely of steel with watertight rivet-joints.

The "S-A" unit screen-elevator, a combination, is suitable for small fixed or portable installations. The head sprockets of the elevator are mounted on the same shaft with the conical screen. One sprocket is carried by the screen itself. The elevator buckets are designed to discharge by gravity into a



STEPHENS-ADAMSON GRAVEL PLANT AND GILBERT SCREEN.

chute carried between the head sprockets and delivering to the screen. The screen may be single or jacketed and built to any suitable length or diameter. The Gilbert screens are made in a number of sizes varying from 24 inches in diameter at the small end, 36 at the large and 54 long to 48 by 65 by 84.

The unit plant is made in a portable arrangement. The one in the illustration is for three sizes of gravel. The engine and driving machinery are carried on the front end, entirely protected from the material. Hinged spouts and slide gates are provided on each side. The entire arrangement of bins and screens may be lowered into the truck frame, the hoisting mechanism being actuated through self-locking worm gears.

These screens and plants, in addition to handling and conveying machinery and screens of all types, are made by the Stephens-Adamson Mfg. Co., Aurora, Ill.

"ROCMAC."

1915 Specifications for "Rocmac" Roads.

The Philadelphia Quartz Co., 121 South Third street, Philadelphia, Pa., has issued the 1915 specifications for road construction using "Rocmac." According to these, the foundation of the road is to be of granite, traprock, limestone or sandstone of approved quality—and properly laid and rolled with a roller weighing not less than 10 tons. This foundation course is filled with stone screenings, sand or clean loam and rolled firm. The materials used in constructing the wearing surface are "Rocmac" binder, limestone dust and crushed stone. The limestone dust shall pass a $\frac{1}{4}$ -inch screen, contain at least 60 per cent. dust and by chemical analysis, show at least 50 per

cent of calcium carbonate. The stone shall be hard, tough limestone, fine-grained granite or traprock passing a 2-inch circular ring and retained in a 1-inch ring and should be free from dust and dirt.

One of two methods, pressure or mixing, may be used in constructing the wearing surface which shall be 3 inches thick. In the pressure method the "Rocmac" matrix or mortar, consisting of Rocmac solution, is thoroughly mixed with the limestone dust in proportion of 36 gallons to 1 cubic yard of dust with enough water added to give uniform working consistency and is spread on the foundation. The matrix is to fill the voids, $1\frac{1}{2}$ inches being enough to fill the usual 2-inch stone. The stone is then evenly distributed over the matrix to a depth of 4 inches, loose measurement. In the other method the matrix is mixed as before and then the stone added and the whole thoroughly mixed. With the usual 2-inch stone the proportions of $2\frac{1}{2}$ parts of stone to 1 of limestone screenings will give the desired results. The aggregate thus obtained is spread to a depth of 4 inches. The surface is rolled under a 10-ton roller, a light sprinkling of water being used to facilitate puddling. All brooming and rolling should be done carefully.

GOOD ROADS OUTFIT.

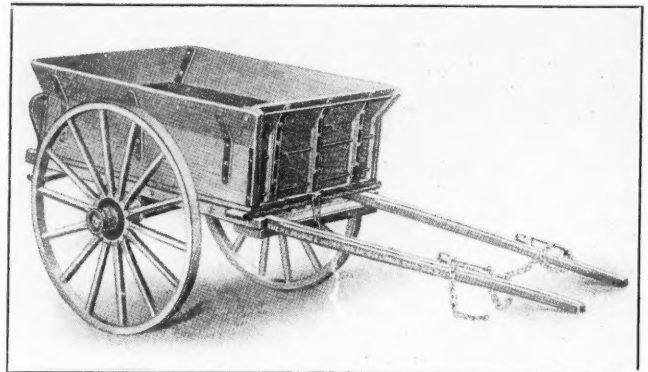
"Universal" Portable Crusher.

"Universal" roll jaw force feed rock crushers are made in a number of styles and sizes for various purposes and are mounted on trucks or skids, as desired. The crushers may be quickly adjusted to give a number of different sizes of product. They have manganese steel jaw plates and dust-proof ring oilers.

The 1915 good roads outfit, No. 8, is the latest type. The weight is much reduced, making easy hauling over bad roads. It has an opening 8 x 16 inches, can be operated by 15 h. p. and the ca-

capacity with the jaws set $2\frac{1}{2}$ inches apart is approximately 125 tons per day. The steel elevator is attached and can be folded very easily and is either 16 or 18 feet long. The screen and loading bins, as shown in the illustration, are also mounted on trucks. The axles are strong, the wheels are steel and wide tired. The feeding platform is less than 40 inches high and can be used from either side. The outfit may be had with a special loading device.

The outfit is built in different styles, with or without power, steam or gaso-



KILBOURNE & JACOBS DUMP WAGON.

line. The capacities vary from 25 to 150 tons.

The new type of crusher, together with the screen and bins is shown in the illustration. The manufacturers are the Universal Crusher Co., Cedar Rapids, Ia.

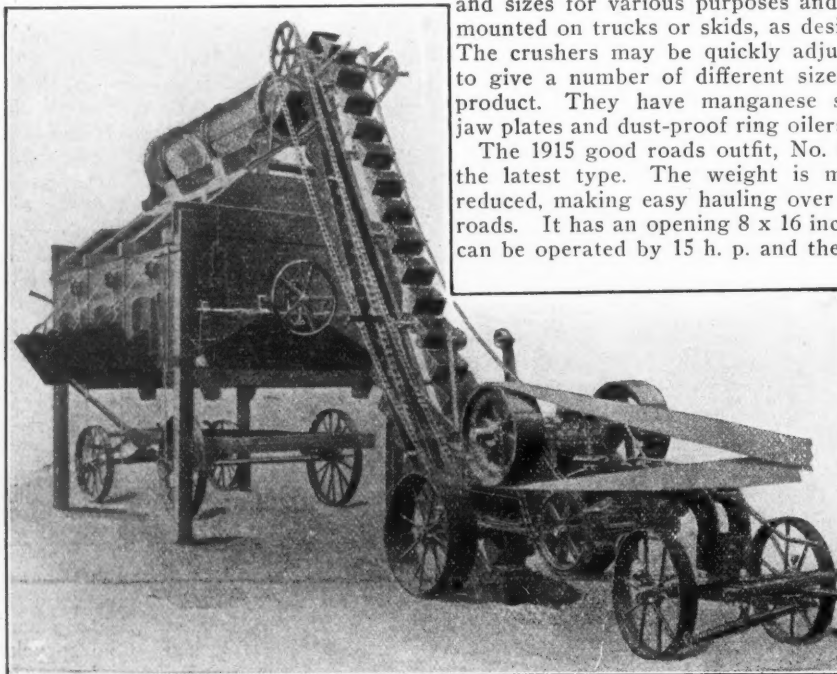
WAGON LOADER.

With a Yard a Minute Capacity.

That a wagon loader is economical and efficient in handling sand, gravel or broken stone in road work has been undeniably proved. With the Haiss wagon loader it is claimed that a truck may be filled at the rate of 1 cubic yard a minute. The loader will dig into a storage pile of $1\frac{1}{2}$ -inch or 2-inch broken stone with very effective power. The entire loader is built of steel. All clutches are eliminated and the annoyance of slipping clutches avoided. A crowding device similar to that in a steam shovel pushes the elevator medium along the body of the truck, giving the digging action.

There are twenty carbon steel buckets, 18 by 12 inches, with a capacity of $\frac{1}{2}$ cubic foot each. These buckets are bolted across two steel pin chains at intervals of 18 inches. The steel pin chains carry the loaded buckets over steel sprockets at the ends of the elevator. The truck wheels are of large diameter and are all equipped with roller bearings to make movement of the loader easy for two laborers. The front wheels are 24 inches and the rear 54. In moving under overhead obstructions the elevator may be lowered to a horizontal position by releasing a hook. The height with the elevator collapsed is 8 ft.; when working the dimensions are: height, 13 ft.; width, 5 ft. 11 in.; length, 12 ft.

The loader may be equipped either with a General Electric Co. high torque



"UNIVERSAL" CRUSHER.

motor developing up to 10 h. p., or with a Brenner gasoline engine. The latter is a double cylinder opposed motor developing up to 20 h. p. It is calculated that the power cost is less than 1 cent per cubic yard. Comparative costs are claimed showing that under ordinary conditions the loader will save \$1.42 in loading and \$1.25 in delivery, making a total of \$2.67 on every 5 cubic yards delivered.

The illustration shows the Haiss loader at work at 2-inch trap rock for Lanigan Bros. Stone Co., New York. The loader is made by the George Haiss Mfg. Co., Inc., 141st street and Rider avenue, New York City, N. Y.

CONTRACTORS' DUMP CARTS.

The equipment manufactured by the Kilbourne & Jacobs Mfg. Co., Lincoln street, Columbus, O., includes a line of contractors' carts of all types. The heavy dump cart has a capacity of 24 cubic feet and a weight of about 934 pounds; the light cart takes 21 cubic feet and weighs about 705 pounds. The carts are durably constructed, with solid rear framing, the joints being firmly bolted and tied by extensions of the irons with which the ends of the sills are shod. They are made throughout of hardwood lumber and are thoroughly braced and bolted, the framing consisting of heavy side and cross sills, each side-board being secured to its sill by four anchor bolts. The front of the bed is bound together by two heavy tie-rods. The front end-gate is fitted between heavy strips on each side-board and is removable. All wearing points are protected; the bed is iron strapped all around the top and the rear sill ends are iron shod. The wheels are set to standard, wide tread, 5 feet 4 across tires, and are of the "K. & J." sand-proof malleable hub type.

Either the heavy or light cart may be had with wing boards or hopper, as shown in the illustration. The hopper adds 14½ cubic feet to the capacity of the cart and about 100 pounds to the weight.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago—The leading interest has received contracts for 1,200 tons of pipe for Duluth and 2,500 tons for Akron, O. In the Cleveland 13,000-ton contract, about 9,000 tons are 30, 36, 42 and 48 inches. Quotations: 4-inch, \$25.50; 6 to 12-inch, \$23.50; 16-inch and up, \$23. Birmingham—The large water and gas pipe factories are still busy and delivery is active, there being little or no accumulation. Quotations: 4-inch, \$20; 6-inch and up, \$18. New York—A contract for 650 tons of 6 to 12-inch has been awarded by the Department of Water Supply, Gas and Electricity of New York. Wellesley, Mass., has opened bids for 800 tons of 6 to 14-inch. A contract for Philadelphia for a large amount of pipe up to 48-inch is expected. General demand is about nor-

mal for season. Quotations: 6-inch, \$20 to \$20.50.

Lead.—Quotations: New York, \$4.10; St. Louis, \$4.05.

Price Reductions in Edison Mazda Lamps.—Practically all the sizes and types of Edison Mazda multiple lamps are affected by reductions in list prices that are put into effect April 1 by the Edison Lamp Works of General Electric Company. On the regular straight side and round bulb lamps, from the 10-watt to the 250-watt sizes, also on sign lamps, stereopticon lamps, etc., the reductions range from 3 to 20 cents per lamp, according to the size. These reductions, which average about 10 per cent., will tend to popularize further already popular lamps. The new concentrated filament vacuum lamps of 25, 40 and 60-watt sizes now list at only 5 cents per lamp more than the regular lamps of corresponding sizes. On the gas-filled, multiple lamp of 100 to 1000-watt sizes, the reductions range from 50 cents to \$1.00 per lamp, the average reductions being between 20 and 25 per cent. The introduction of gas-filled lamps has been exceptionally rapid. Over a million are already in use. The decreased cost of these lamps will undoubtedly result in a still more rapid replacement of vacuum lamps by the more efficient units.

Bitulithic Patents Sustained.—Justice Hindman has handed down at Calgary, Alta, a decision in an important patent case of Warren Brothers Company, of Boston, vs. the city of Calgary and the Canadian Mineral Rubber Company, of which the American Asphalt & Rubber Company, of Chicago, is subsidiary. The suit grew out of an alleged infringement by the defendants of the basic Canadian patents of Warren Brothers Company, covering the bitulithic pavement. The infringing paving contract awarded in 1912 was an unusually large one, ag-

gregating about \$300,000. On application for preliminary injunction the court decided the patent to be valid and that the contract of the Mineral Rubber Company provided for infringement, but permitted the work to proceed, on the contractor filing bond for \$60,000 as security for damages and depositing with the court \$5,000 as punitive damages in case decision after trial of the case showed infringement to have actually resulted from the construction. The decision just rendered remands the case to a referee to determine damages and directs payment to the plaintiff company of the amount so determined. In the meantime the defendant company, the Canadian Mineral Rubber Company and its United States subsidiary, the American Asphalt & Rubber Company, passed into the hands of receivers about a year ago and the receiver reports it to be insolvent in consequence of which the judgment for damages will have to be paid by the surety company.

The present is the first decision in Canada on the Warren or bitulithic patents, but follows the United States decisions on the same patent. The first United States Bitulithic Patent Case, Warren Brothers Company vs. Owosso, Michigan, was written by the late Justice Lurton, of the United States Supreme Court in 1909, while he was presiding justice of the United States Circuit Court of Appeals for the Sixth Circuit. A petition for certiorari to the United States Supreme Court in the Owosso case was unanimously denied.

The Terry Steam Turbine Co., Hartford, Conn., announces that its Chicago office is now in charge of Mr. A. W. de Revere, and is located in the Peoples Gas Bldg. An office has been opened in the Michigan Trust Bldg., Grand Rapids, in charge of Mr. A. L. Searles, to cover the southern peninsula of Michigan.



HAISS WAGON LOADER.

The Kindling Machinery Co., Milwaukee, Wis., has sold to the board of public safety of Louisville, Ky., two Kindling squeegee street-cleaning machines at \$1,250 each. The machines are combination sprinklers and sweepers.

The Wyckoff Pipe & Creosoting Co., Inc., have removed from 50 Church street, New York, to the Forty-second street bldg., 30 East 42d street.

The Baker Mfg. Co., 535 Stamford avenue, Springfield, Ill., has received an order from the city council of Janesville, Wis., for a new Twentieth Century Pick-Up Sweeper.

Chas. T. Topping Machinery Company, Pittsburgh, Pa., dealers in contractors', mine and quarry equipment, announce the removal of their offices to suite 928, Oliver Building. They will continue as direct representatives in western Pennsylvania and northern West Virginia for Koehring concrete mixers, Clyde hoisting engines and derricks, Wylie concrete distributing systems; the Cement-Gun, McKiernan-Terry pile hammers and rock drills; Negley slack-cable excavators; Buchanan rock and ore crushers, crushing rolls and magnetic separators, Patten electric builders' hoists, Easton industrial cars and railway systems, Converse portable sand screens; Hotchkiss steel forms, and other well-known lines of machinery and equipment.

NEWS OF THE SOCIETIES.

(Continued from page 445.)

cities in the state have been asked to send motion pictures of their principal municipal activities. These will be shown at the exhibit.

The Conference announces that it is not its purpose to make this exhibit a paying venture, and that the charge will be only enough to cover the running expenses of the undertaking. It further says in its announcement: "The benefits to be derived from exhibiting at this conference are apparent. It brings the products of the manufacturers in close touch with the 500 members of the municipal departments who will be present, and it is the only opportunity during the year that manufacturers have to demonstrate their products to all of the city officials of the Empire State. C. R. Metzger, General Secretary of the Troy Chamber of Commerce, is secretary of the committee."

West Michigan Pike Association.

The annual meeting of the West Michigan Pike Association was held in conjunction with the Michigan State Good Roads Association, March 9-12, at Lansing. At the last session, the following officers were elected:

President, William H. Loutit, of Grand Haven; vice-president, Frank Hamilton, of Traverse City; secretary, L. H. Conger, of Muskegon, to succeed himself; treasurer, Richard M. Hoffman, of Manistee.

County vice-presidents were chosen as follows: Berrien county, R. H. Sher-

wood, Watervliet; Van Buren, Dr. G. T. Young, South Haven; Allegan, William F. Takken, Saugatuck; Ottawa, William M. Connelley, Spring Lake; Muskegon, Edward R. Swett, Muskegon; Oceana, J. D. Hansen, Hart; Mason, Warren Cartier, Ludington; Manistee, J. E. Merritt, Manistee; Benzie, J. F. Hoffstetter, Frankfort; Dr. C. L. Covey, Honor, Leelanau, David H. Day, of Glen Haven; Grand Traverse, John R. Santo, Traverse City; Antrim, Charles B. Carver, Elk Rapids; Charlevoix, Daniel S. Payton, Charlevoix; Emmet, Hon. A. L. Deuel, Harbor Springs.

The date for the third annual West Michigan pike tour was set for July 12, and will start from St. Joseph and end at Mackinaw City on July 16.

PERSONALS

The following have been elected:

Biddeford, Me.—City clerk, Thomas F. Locke; city treasurer, Ernest A. Goodwin; city physician, Dr. George C. Precourt; chief engineer, Charles H. Bonser; street commissioner, Dist. 4, Christopher C. Gilpatrick; park commissioner, Dr. D. E. Dolloff. The joint standing committees appointed by Mayor Smith are as follows: Finance, Mayor, Alderman Banks, Councilmen Goldthwaite, Finnell, Bellerose; public property, Mayor, Alderman Goldthwaite, Councilman Mahaney, Valliere and Goldthwaite; fire department, Mayor, Alderman Lynch, Thibault, Councilmen Bouthilette, Hobins and Johnson; streets, Mayor, Aldermen McKeen, Roy, Councilmen Rhodes, Dennett, Falker and Daley.

Vassalboro, Me.—E. C. Barrows, moderator; W. B. Crosby, E. O. Brown and J. W. Kennedy, selectmen.

Rutland, Vt.—B. L. Stafford, mayor; D. J. Anthony, president of council; E. R. Patch, commissioner of public Works; R. S. Pike, commissioner of public safety; B. S. Hylan, chief of police; H. B. Whittier, city clerk; Dr. C. A. Gale, member board of trade.

Eastwood, N. Y.—S. L. Champlin, president; L. B. Smith, clerk; Daniel Dennison, street commissioner.

Sanford, Me.—W. H. Morrill and E. P. Shaw, road commissioners; M. E. Bennett, chief fire department; Dr. F. F. Bernier, member board of health.

Saco, Me.—Dr. E. H. Minot, president board of aldermen; I. S. Boothby, president of common council.

Waterville, Me.—Burleigh Martin, city clerk; A. G. Norcross, street engineer; J. G. Longfellow, street commissioner, eastern district; W. S. Knowles, street commissioner, western district; Dr. W. S. Hill, park commissioner.

Hallowell, Me.—Fire department, chief engineer, George Densmore; first assistant, Charles J. Smith; city physician, Dr. C. E. H. Beane; inspector of buildings, George M. Densmore; water commissioner, Howard E. Andrews.

So. Hadley Falls, Mass.—Clerk and

treasurer, Martinus Madsen; chief engineer fire department, Dennis J. Houlihan; water commissioner for three years, George F. Bondreau.

Fort Plain, N. Y.—Clerk, Charles B. Snell; chief of police, Worth Abbott; assistant police, Edwin Dunckel; street commissioner, Barney Sculley; garbage collector, Arthur Beck; water commissioner, A. E. Tanner. The appointment of sewer commissioner and the standing committees was put over until next meeting.

Dubuque, Ia.—U. S. Lewis, mayor, re-elected.

Castleton, N. Y.—G. S. Schermerhorn, clerk; John Hudson, road commissioner and superintendent of waterworks.

Bishopville, S. C.—W. L. Parrott, mayor, re-elected; A. M. Lee, G. O. Rogers, W. N. McLeod, N. J. Laney and J. L. Shuford, aldermen.

Lestershire, N. Y.—W. C. Lewis, clerk; Orville D. Hadden, chief of police; John S. Patterson, water commissioner; Henry Landon, street commissioner.

Highland Falls, N. Y.—Daniel McDonald, clerk; Smith Mandigo, road commissioner; Samuel Carlton, chief of police.

Clinton, N. Y.—William Brockway, village clerk; Frank T. Pequin, street commissioner; Wm. J. Franklin, chief of police; Dr. George R. Taylor, president water and light commission.

Herkimer, N. Y.—Harry P. Wood, clerk; Charles A. Snyder, street commissioner.

Union, N. Y.—J. M. Payne, village clerk; C. A. Mersereau, street commissioner; F. E. Whitcomb, fire commissioner; C. F. Brainerd, chairman streets and lights committee; E. Anson, water committee; B. Pitkin, street committee.

Morrisville, N. Y.—Joel J. Parker, clerk; Henry Ellis, street commissioner; Jesse H. Parker, superintendent water system.

Sulphur Springs, Texas.—L. E. Gee, mayor, re-elected.

Clifton Springs, N. Y.—Charles D. Hill, clerk; R. L. Leland, water commissioner; G. A. Durkee, street commissioner.

Oldtown, Me.—John H. Hickery, mayor; J. L. Lucy, Henry Curran, W. A. Skedd, L. H. Pelletier, A. H. Crawford, W. W. Ellingwood, C. E. Legg, C. E. Sutton and J. F. Davis, aldermen.

Nelliston, N. Y.—Daniel Dahlen, clerk; Henry Ehrhard, chief of police and street commissioner.

Martin, Irving, of Stockton; Chandler, A. E., of Berkeley, irrigation engineer, and Johnstone, W. A., have been appointed by Governor Johnson as members of the State Water Commission of California.

Long, Henry D., has been appointed chief of police of Montgomery, Ala., succeeding W. H. Taylor, resigned.

Fahey, Thomas, has been selected chief and James Stevens assistant chief of police of Rensselaer, N. Y.

Wadley, Frank W., has been appointed road commissioner for Clyde, N. Y.

ADVANCE CONTRACT NEWS

ADVANCED INFORMATION BIDS ASKED FOR

CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
La.	New Orleans	noon, Apr.	3.. Five miles of earth road	W. E. Atkinson, St. Hwy. Engr.
Minn.	Duluth	9.30 a.m., Apr.	3.. 3 1/4 miles gravel road	O. Halden, Co. Aud.
N. J.	Phillipsburg	2 p.m., Apr.	3.. Paving with wood block	R. P. Howell, Comr. Streets.
N. J.	Chesterfield	Apr.	3.. 3 1/2 miles macadam	Township Clerk.
Conn.	Manchester	5 p.m., Apr.	3.. 7,000 to 10,000 ft. of curbing and about 50,000 sq. ft. concrete walk	H. I. Taylor, Selectman.
O.	Caledonia	Noon, Apr.	3.. 2,500 yds. brick paving	Village Clerk.
Mich.	Menominee	5 p.m., Apr.	3.. Paving streets	F. F. Norcross, City Clk.
Ky.	Winchester	Noon, Apr.	3.. Maintenance work on county roads.	Clerk Fiscal Court.
Ind.	Brownstown	Apr.	5.. Road graders	Albert Leudtke, Co. Aud.
Que.	Potton	Apr.	5.. 11 1/2 miles gravel and stone road.	J. N. Labell, Sec. & Treas.
Minn.	Maple Grove	11 a.m., Apr.	5.. Grading and graveling about two miles of road.	Al. P. Erickson, Co. Aud.
N. D.	Mayville	8 p.m., Apr.	5.. Constructing cement sidewalks in 1915.	Henry Leum, City Aud.
Ill.	Highland	6 p.m., Apr.	5.. About seven carloads road oil.	Fred Koch, Chr. St. Cleaning.
N. D.	Drayton	4 p.m., Apr.	5.. Constructing concrete sidewalks in 1915.	R. A. Gilroy, Co. Aud.
Wis.	Kaukana	2 p.m., Apr.	5.. About 12 blocks of asphalt, brick or concrete paving.	City Clerk.
Pa.	Lewistown	7.30 p.m., Apr.	5.. Paving with brick	City Clerk.
Cal.	Sacramento	2 p.m., Apr.	5.. 21 miles concrete road construction.	A. B. Fletcher, St. Hwy. Comr.
Ind.	Richmond	10 a.m., Apr.	5.. Paving with brick	Board Public Works.
Ind.	Kokomo	10 a.m., Apr.	5.. Building cement sidewalk and paving.	Board Public Works.
Minn.	St. Paul	10 a.m., Apr.	5.. 1,430 yds. creosoted wood block paving; 7,200 cement sidewalk tile	Aug. Hohenstein, Pur. Agt.
N. D.	Jamestown	2 p.m., Apr.	5.. Road to cost about \$8,000.	Andrew Blewett, Co. Aud.
N. D.	Aneta	Apr.	5.. Concrete walks and crossings.	C. E. Fodness, City Aud.
N. D.	Fessenden	8 p.m., Apr.	5.. Construction of concrete and wooden sidewalks.	L. W. Wigley, City Aud.
N. D.	Park River	7.30 p.m., Apr.	5.. Constructing sidewalks	F. J. Prochaska, City Aud.
N. D.	Minot	8 p.m., Apr.	5.. Constructing sidewalks	A. D. Hagenstein, City Aud.
N. D.	Walhpeton	7.30 p.m., Apr.	5.. Sidewalks, curbs and gutters.	S. H. Murray, City Aud.
N. D.	Ellendale	8 p.m., Apr.	5.. Concrete sidewalks and cross walks.	John King, City Aud.
Pa.	Connellsville	8 p.m., Apr.	5.. Curbing, grading and paving streets.	John L. Gans, Pur. Agt.
Wash.	North Yakima	Apr.	5.. Macadamizing and graveling 6 miles.	O. E. Brashers, Co. Engr.
Wash.	Chehalis	Apr.	5.. 7,040 yds. concrete road.	I. W. Montfort, Co. Aud.
Wash.	Bellingham	Apr.	5.. County road construction.	County Engineer
Wash.	Ritzville	Apr.	5.. 9 1/2 miles county highway.	County Commissioners
Ind.	Valparaiso	2 p.m., Apr.	5.. Two gravel roads	C. H. Blachley, Co. Aud.
Md.	Cumberland	9.30 a.m., Apr.	5.. Paving with brick	A. W. Straub, City Clk.
Ind.	Jeffersonville	10 a.m., Apr.	5.. Grading, paving and improving road.	G. W. Stoner, Auditor.
Ind.	Greencastle	2 p.m., Apr.	5.. Grading, paving and improving road.	C. L. Airhart, Co. Aud.
Ind.	Greenfield	10 a.m., Apr.	5.. Grading, paving and improving road.	Lawrence Wood, Co. Aud.
Minn.	Minneapolis	11 a.m., Apr.	5.. One or more cars of road oil.	Al. P. Erickson, Co. Aud.
La.	Lake Charles	10 a.m., Apr.	5.. Construction of highways Nos. 5 and 7.	E. C. House, Clk. Police Jury.
N. D.	Portland	8 p.m., Apr.	5.. Cement sidewalks for 1915.	A. A. Kappang, City Aud.
Ind.	Huntington	10 a.m., Apr.	5.. Grading, paving and improving roads.	Harold Guthrie, Co. Aud.
Ind.	Brazil	10.30 a.m., Apr.	5.. Grading, paving and improving roads.	W. O. Graesser, Co. Aud.
Wash.	Ephrata	2 p.m., Apr.	5.. Two miles water bound macadam.	Belvidere.
Ind.	Salem	Apr.	5.. Constructing two roads.	C. T. Sanders, Co. Aud.
Ind.	Newport	10 a.m., Apr.	5.. Gravel road construction.	I. H. Rutherford, Co. Aud.
N. J.	Plainfield	8 p.m., Apr.	5.. Concrete pavement	J. T. McMurray, City Clk.
N. J.	Bloomfield	8 p.m., Apr.	5.. Laying concrete walk and bluestone curbs.	R. F. Davis, Town Clk.
N. Y.	Albany	2 p.m., Apr.	5.. Repaving with redressed granite blocks, paving with brick and asphalt	I. Wachsman, Sec. Bd. C. & S.
Tex.	Ft. Worth	9 a.m., Apr.	6.. 28,500 yds. asphalt or bituminous concrete paving.	F. J. Von Zuben, City Engr.
Ind.	Greenville	10 a.m., Apr.	6.. Road construction	Roy Slater, Co. Aud.
Wash.	Spokane	Apr.	6.. Paving with asphalt macadam; cost, \$150,000.	County Comrs.
La.	Lake Charles	10 a.m., Apr.	6.. Road construction	County Clerk.
S. D.	Leola	3 p.m., Apr.	6.. Grading highways during 1915.	J. B. Wittmayer, Co. Aud.
N. D.	Mohall	2 p.m., Apr.	6.. Two elevating road graders and road grading.	Peter Carlson, Auditor.
Ind.	Corydon	2 p.m., Apr.	6.. Grading, paving and improving road.	J. L. O'Bannan, Co. Aud.
Ind.	Boonville	10 a.m., Apr.	6.. Grading, paving and improving road.	G. H. Bass, Co. Aud.
Ind.	Knox	Noon, Apr.	6.. Grading, paving and improving road.	Chas. W. Weniger, Co. Aud.
Ind.	Winchester	10 a.m., Apr.	6.. Grading, paving and improving road.	C. E. Tillson, Co. Aud.
Ind.	Madison	1 p.m., Apr.	6.. Grading, paving and improving road.	C. S. Tibler, Co. Aud.
Ind.	Columbus	10 a.m., Apr.	6.. Gravel road construction	W. H. Scott, Co. Aud.
Ind.	Bloomfield	1 p.m., Apr.	6.. Macadam road construction	G. E. Kidd, Co. Aud.
Ind.	Logansport	10 a.m., Apr.	6.. Road construction	W. F. Kinsler, Co. Aud.
Ind.	Decatur	10 a.m., Apr.	6.. Two macadam roads	T. H. Baltzell, Co. Aud.
Pa.	Vincennes	2 p.m., Apr.	6.. Gravel road construction	J. I. Muentzer, Co. Aud.
Pa.	Sharon	Apr.	6.. Asphalt filler for brick pavements.	C. B. Lantz, Boro. Secy.
N. D.	Fessenden	2 p.m., Apr.	6.. Grading roads	F. B. Paul, Co. Aud.
La.	Le Mars	Apr.	6.. Concrete walks, curbs and gutters.	E. S. Townsend, City Clk.
Ind.	Martinsville	Noon, Apr.	6.. Grading, draining and paving road.	Sam Watson, Co. Aud.
Ind.	Delphos	Noon, Apr.	6.. Grading, paving and improving roads.	M. G. Haun, Co. Aud.
Ind.	Washington	2 p.m., Apr.	6.. Grading, paving and improving roads, seven jobs.	L. S. Core, Co. Aud.
Wis.	Oconomowoc	Apr.	6.. Constructing concrete and cement sidewalks.	C. H. Schoenike, City Clk.
Tex.	Marshall	Apr.	6.. Twenty miles gravel and macadam road.	N. P. Turner, Highway Engr.
N. Y.	Auburn	8 p.m., Apr.	6.. Street paving	C. W. Brister, Mayor.
Ky.	Paducah	Noon, Apr.	6.. Repairing and maintaining dirt roads for one year.	J. R. Thompson, Road Engr.
Cal.	Fairfield	Apr.	6.. Road improvements	County Commissioners.
N. J.	Paterson	4 p.m., Apr.	6.. Resurfacing and repairing asphalt streets; grading, curbing and guttering streets and laying sewer.	H. J. Harder, City Engr.
Wash.	South Bend	Apr.	6.. Improving and macadamizing road.	City Clerk.
Ind.	South Bend	10 a.m., Apr.	6.. Laying curbs, sidewalks, pavement and pipe sewers.	Board Public Works.
Ind.	New Albany	10 a.m., Apr.	6.. Grading, paving and improving roads.	J. T. Miller, Co. Aud.
Ind.	Marion	2 p.m., Apr.	6.. Grading, paving and improving roads.	E. H. Kimball, Aud.
Ind.	Covington	2 p.m., Apr.	6.. Grading, draining and graveling road, two jobs.	H. W. Newlin, Co. Aud.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
N. J.	Paterson	4 p.m., Apr.	6.. Repairing and resurfacing asphalt pavement.....	J. E. Taylor, City Street Comr.
N. J.	Bayonne	8 p.m., Apr.	6.. 93,000 yds. asphalt pavement; 35,000 ft. bluestone curb- ing; 9,500 sq. ft. concrete walk; 63,800 sq. ft. bluestone walk; 4,230 ft. concrete curb and gutter; 17,800 yds. bituminous concrete	W. P. Lee, City Clerk. Edo M. Yereance, Twp. Clk. Edward Arcularius, Twp. Clk. Adam Rose, Cr. H'way Com. H. Chenshaw, City Secy. C. T. Kain, Co. Aud.
N. J.	Acquackanonk	8 p.m., Apr.	6.. Furnishing road oil and crushed stone.....	G. C. Wartman, Sec. Co. Bd. Contract & Supply.
N. J.	Maplewood	8 p.m., Apr.	6.. Furnishing 40,000 gals. road oil.....	A. R. Callow, Comr. P. & S. Borough President.
Pa.	Sharon Hill	8 p.m., Apr.	7.. Resurfacing and treating streets with bituminous binder.....	Borough President.
Tex.	Bryan	11 a.m., Apr.	7.. Grading and paving with concrete.....	L. M. Kotecki, Controller. City Clerk.
Ind.	Bluffton	Apr.	7.. 1½ mile gravel road construction.....	R. E. Smith, Co. Aud.
N. Y.	Schenectady	2.30 p.m., Apr.	7.. Resurfacing with asphalt 19,300 yds., and laying 2,350 yds. concrete foundation	F. G. Sloan, Chairman. Rudolph Jager, Co. Surv. County Comrs.
O.	Cleveland	Noon, Apr.	7.. Draining, curbing and grading streets.....	A. L. Hillis, City Engr. F. W. Fagel, Co. Aud.
N. Y.	L. I. City	11 a.m., Apr.	7.. Regulating and grading and laying sidewalks.....	W. H. Lynch, Supt. T. E. Flaherty, Co. Aud.
N. Y.	Brooklyn	11 a.m., Apr.	7.. Paving with asphalt, curbing and laying sidewalks.....	J. R. Stannard, Co. Clerk. I. J. Casey, Jr., Twn. Engr.
Wis.	Milwaukee	10.30 a.m., Apr.	7.. Furnishing about 350,000 gals. road oil.....	Board of Co. Comrs.
Ore.	Gold Beach	Apr.	7.. Road construction	W. T. Patton, Co. Aud.
S. D.	McIntosh	2 p.m., Apr.	7.. Twenty-two miles earth road.....	County Commissioners Edward Simon, Co. Aud.
N. J.	Paterson	Apr.	7.. Repairing and macadamizing road; also repairing bitu- lithic concrete	J. T. Miller, Co. Aud. L. A. Wilson, City Mgr.
S. D.	McIntyre	2 p.m., Apr.	7.. County highway grading	F. L. Anders, City Engr. C. S. Pugh, City Clk.
Ala.	Anniston	Apr.	7.. Grading and macadamizing road.....	K. Ferguson, Co. Aud. H. H. Howe, Co. Aud.
Wis.	Marinette	2 p.m., Apr.	7.. 11,000 yds. concrete paving	County Comrs. Co. Supt. of Highways.
Ind.	Shelbyville	11 a.m., Apr.	7.. Gravel and crushed stone road	J. L. Bauer, Co. Aud.
Pa.	Harrisburg	Noon, Apr.	7.. Furnishing and erecting sheet asphalt plant.....	H. C. Cass, Dir. Pub. Service. A. R. Callow, Comr. P. & S.
N. D.	Bismarck	2 p.m., Apr.	7.. Grading and improving road.....	K. J. Barr, Co. Supt. Hwys. Paris.
Ore.	Gold Hill	Apr.	7.. Road construction	Board of Co. Comrs.
N. J.	Irvington	8 p.m., Apr.	7.. For 60,000 gallons road oil.....	G. W. Lee, Co. Clk.
Fla.	Jacksonville	10 a.m., Apr.	8.. 90 ft. of 84-inch segment block culvert.....	C. O. Higgins, Co. Aud.
Ind.	Indianapolis	10 a.m., Apr.	8.. 9,000 gallons road binder.....	Co. Auditor.
Ind.	La Porte	Apr.	8.. Subway for Lincoln highway.....	County Comrs.
Ind.	Crown Point	Apr.	8.. Gravel road construction	Edward Simon, Co. Aud.
Ky.	Louisville	Apr.	8.. Three miles gravel road	J. T. Miller, Co. Aud.
La.	Clarinda	Apr.	8.. 12,700 yds. pavement.....	L. A. Wilson, City Mgr.
N. D.	Fargo	Apr.	8.. 45,000 yds. street paving.....	F. L. Anders, City Engr.
Kan.	Ottawa	Apr.	8.. Thirteen blocks brick paving.....	C. S. Pugh, City Clk.
N. D.	Carrington	2 p.m., Apr.	8.. Road grading	K. Ferguson, Co. Aud.
S. D.	Sioux Falls	2 p.m., Apr.	8.. Road graders	H. H. Howe, Co. Aud.
Fla.	Jacksonville	10 a.m., Apr.	8.. About 68 miles of brick, asphalt macadam or other hard surface paving	County Comrs. Co. Supt. of Highways.
Ill.	Paris	Apr.	9.. About two miles gravel road.....	J. L. Bauer, Co. Aud.
N. J.	Elizabeth	2.30 p.m., Apr.	9.. Cleaning and regrading gutters.....	H. C. Cass, Dir. Pub. Service.
O.	Marion	Noon, Apr.	9.. Street paving and sewer construction.....	A. R. Callow, Comr. P. & S.
O.	Cleveland	Noon, Apr.	9.. Furnishing road oil	K. J. Barr, Co. Supt. Hwys. Paris.
Ill.	Vermilion	2 p.m., Apr.	9.. Improving and graveling 10,254 ft. road.....	Board of Co. Comrs.
O.	Cincinnati	Noon, Apr.	9.. Macadam road construction	G. W. Lee, Co. Clk.
Kan.	Hutchinson	Noon, Apr.	9.. Improving five miles of road.....	C. O. Higgins, Co. Aud.
O.	Mt. Gilead	noon, Apr.	9.. 3.5 miles macadam roads	Co. Auditor.
Ind.	Crown Point	1 p.m., Apr.	9.. Crushed stone	County Comrs.
Ala.	Fort Payne	Apr.	9.. Grading and macadamizing road.....	Edward Simon, Co. Aud.
Ind.	Indianapolis	1 p.m., Apr.	9.. Crushed stone, gravel, screenings and slag.....	F. Romaglia, Boro. Clk.
N. J.	Garfield	8 p.m., Apr.	9.. Grading streets and placing pavement and curb.....	S. W. Mahaffey, Dir. P. Serv.
O.	Conneaut	Noon, Apr.	10.. 1,350 yds. brick paving and 1,300 ft. concrete curb.....	N. G. Wallace, Co. Aud.
Ind.	Terre Haute	11 a.m., Apr.	10.. Grading, paving and improving road.....	T. M. Howerton, Engr.
N. C.	Bryson City	Apr.	10.. Constructing 26 miles of road.....	City Clerk.
Tenn.	Selmer	Apr.	10.. About 10,000 sq. ft. concrete sidewalk.....	J. C. McWhinney, Co. Aud.
N. D.	Steele	2 p.m., Apr.	10.. Grading county road	L. C. Massey, Co. Clk.
W. Va.	Charleston	Apr.	10.. 17½ miles hard surfaced road.....	Public Works Committee.
Wis.	Beloit	2 p.m., Apr.	10.. About 128,000 yds. first class paving, 85,300 ft. curb and gutter, and 500 ft. of covered gutter.....	D. Neville, Co. Engr.
Wash.	Curtis	Apr.	10.. Constructing two miles concrete highway.....	Harry Tippet, Twp. Clk.
N. J.	Montclair	Apr.	12.. Asphalt and asphalt road oil.....	E. E. Sands, City Engr.
Tex.	Houston	10 a.m., Apr.	12.. Street paving to cost \$187,000.....	F. O. Stanford, City Rec.
Utah	Ogden	10 a.m., Apr.	12.. Grading streets and constructing concrete curbs and gut- ters	J. W. Reese, Co. Judge.
Tex.	Rockwall	Apr.	12.. Building 600 ft. concrete curb and gutter.....	County Engineer.
Ala.	Hamilton	2 p.m., Apr.	13.. Constructing state aid road.....	W. N. Smith, Mayor.
N. J.	Bogota	8 p.m., Apr.	13.. Furnishing and spreading asphaltic oil.....	Board of Water Supply. City Clerk.
N. Y.	New York	11 a.m., Apr.	13.. Paving with brick and macadam, five miles of road and constructing 8 miles of guard walls in Ulster County.....	State Highway Commission. County Auditor.
Ia.	Keokuk	Apr.	13.. Street paving and curbing	Maj. E. H. Schulz, U. S. Engrs. Office.
Md.	Baltimore	Noon, Apr.	13.. 6.18 miles state highway (macadam, brick and asphalt, concrete and granite block).....	Edwin Duffey, Comr.
Minn.	Carver	1 p.m., Apr.	13.. Culverts for state road.....	W. H. Turbitt, City Clk.
La.	New Orleans	11 a.m., Apr.	13.. 10,000 cu. yds. stone.....	W. E. Sykes, Clerk.
N. Y.	Albany	1 p.m., Apr.	14.. About 70 miles state highways.....	Board of Co. Comrs.
Wis.	Prairie du Chien	8 p.m., Apr.	14.. 9,106 yds. paving, 3,500 ft. curb and gutter.....	G. B. Chryste, Town Clerk.
O.	Canal Dover	Noon, Apr.	14.. Street paving	Geo. A. Ralph, Engr.
Fla.	Tavares	Noon, Apr.	15.. 200 miles road work.....	W. T. Patten, Co. Aud.
Ia.	Forest City	Apr.	16.. Grading, curbing and paving.....	Chas. Snyder, Clk., Bascon.
Minn.	Walker	2 p.m., Apr.	16.. Constructing state rural highways.....	L. W. Borders, Co. Aud.
Ind.	Indianapolis	10 a.m., Apr.	17.. Improving streets	County Commissioners.
O.	Hopewell Center	Noon, Apr.	17.. Road improvement	Al. P. Erickson, Co. Aud.
Ind.	Danville	10 a.m., Apr.	19.. Constructing six roads	F. A. Pease Engineering Co., Marshall Bldg.
O.	Geneva	Apr.	19.. 8½ miles brick highway.....	F. T. Williams, City Engr.
Minn.	Excelsior	11 a.m., Apr.	19.. Grading and graveling 3,840 ft. of road.....	County Commissioners.
O.	Cleveland	Apr.	19.. Grading and draining streets at Cleveland Heights.....	Board of County Comrs. Board Public Works.
Fla.	Sanford	Apr.	19.. Bricks for street paving.....	Branch Co. Road Comn.
Ala.	Rockford	Apr.	19.. Grading, draining and surfacing county roads with soil.....	M. A. Powers, City Clerk.
O.	Cincinnati	Noon, Apr.	23.. Grading and macadamizing road.....	J. H. Johnson, City Aud.
Wis.	La Crosse	2 p.m., Apr.	24.. Paving with brick	C. E. Fodness, City Aud.
Mich.	Coldwater	Apr.	30.. Building about 1.5 miles macadam road.....	City Clerk.
Wash.	Walla Walla	Apr.	30.. Paving, to cost \$90,000.....	J. Schuldheisz, City Aud.
N. D.	Grafton	May	1.. Constructing sidewalks, alleys and cross walks.....	
N. D.	Aneta	May	3.. Building concrete walks and crossings.....	
N. Y.	Newburgh	May	4.. Street paving	
N. D.	Kulm	2 p.m., May	5.. Concrete sidewalks	
N. Y.	Buffalo	Apr.	3.. Constructing 8-foot brick sewer and smaller tile, con- crete, brick or segment block sewers	F. G. Ward, Comr. Pub. Wks.
N. J.	Millville	3.30 p.m., Apr.	3.. Sewer pipe	W. F. Ware, Director.
Minn.	Brainerd	8 p.m., Apr.	5.. Lateral sewer construction	A. Mahlum, City Clk.
N. J.	Dunellen	8 p.m., Apr.	5.. Constructing storm sewers.....	W. P. Deering, Boro. Clk.
Mont.	Roundup	8 p.m., Apr.	5.. About 6,500 ft. sewer pipe and necessary work.....	F. A. Appelmann, City Clk.
N. Y.	New York	2 p.m., Apr.	5.. Alteration and improvements to sewer.....	M. M. Marks, Boro. President.

SEWERAGE.

BIDS ASKED FOR

STATE	CITY	RECD UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ind.	Richmond	10 a.m., Apr.	5..Sewer construction	Board of Pub. Works.
Minn.	St. Paul	10 a.m., Apr.	5..Sewer construction	Aug. Hohenstein, Pur. Agt.
Pa.	North Wales	8 p.m., Apr.	5..Furnishing materials and constructing sanitary sewers	R. Schafenacker, Boro. Clk.
Mass.	Boston	Noon, Apr.	5..Constructing pipe sewers and drains	L. K. Rourke, Comr. P. W.
N. J.	Oaklyn	Apr.	6..Constructing sewer system and sewage disposal plant	Remington & Vosburg, Camden.
Wis.	Oshkosh	2 p.m., Apr.	6..Sewer construction	Board Public Works.
la.	Davenport	2 p.m., Apr.	6..Constructing sewers and water services for 1915	Board Public Works.
Minn.	Eveleth	5 p.m., Apr.	6..Constructing storm sewers	A. P. Romer, City Clerk.
Minn.	Buffalo	2 p.m., Apr.	6..Constructing drainage ditch	J. A. Berg, Co. Aud.
Minn.	Wadena	2 p.m., Apr.	6..Drainage ditch construction	Eugene Ross, Co. Aud.
N. J.	Paterson	Apr.	6..Storm water sewer	H. J. Harden, City Engr.
O.	Alliance	Apr.	6..About 4,000 ft. sewer pipe	Dir. Pub. Service.
N. Y.	Niagara Falls	Apr.	6..Paving repair plant	Board Pub. Works.
Utah	Salt Lake City	10 a.m., Apr.	7..Constructing sewers	K. A. Scheid, City Rec.
N. D.	Bismarck	3 p.m., Apr.	7..Driving 3-inch well	T. E. Flaherty, Co. Aud.
Mass.	Fitchburg	3 p.m., Apr.	7..Main intercepting sewers	D. A. Hartwell, Engr.
Wis.	Oconomowoc	1 p.m., Apr.	7..Building sanitary sewers	J. A. Stemper, City Engr.
N. J.	Jersey City	2 p.m., Apr.	8..Constructing 18-in. vitrified pipe sewer	M. I. Fagen, City Clk.
O.	Salem	Apr.	9..Sewer construction, includes 52,000 ft. 8 to 10-in. pipe	City Clerk.
N. Y.	Brooklyn	11 a.m., Apr.	9..Sewer construction	L. H. Pounds, Boro. Pres.
N. Y.	Ravena	Apr.	10..5 miles of 8 to 12-in. sewers and sewage treatment plant	A. L. Swanson, Vil. Clk.
Minn.	St. Cloud	Apr.	13..Laying 10,063 ft. of 8 to 15-in. sewers, 28 manholes and 4 flush tanks	G. D. Magnuson, City Clk.
Md.	Baltimore	Apr.	14..Constructing intercepting sewer	Board of Awards.
la.	State Center	8 p.m., Apr.	15..Sanitary sewer system completed with filters	J. W. Sparks, Town Clk.
la.	Webster City	1 p.m., Apr.	15..Alterations to drain No. 7	A. J. Peterson, Aud.
Wis.	Janesville	2 p.m., Apr.	16..8, 10 and 12-inch sewer construction	Board Public Works.
Ind.	Kokomo	9 a.m., Apr.	16..Drainage ditch construction	E. O. Deeds, Constn. Comr.
O.	Cleveland Heights	Apr.	19..Constructing storm and sanitary sewers	H. H. Canfield, Vil. Clk.
Pa.	Greenville	Apr.	19..Sewage disposal plant, intercepting sewers and laterals	Village Clerk
Gal.	Jefferson	Apr.	19..13,100 ft. vitrified sewer	Homer Hancock, City Clk.
Wis.	Appleton	10 a.m., Apr.	19..Constructing drainage ditches	Bd. of Supv. of the Town of Deer Creek.
La.	New Orleans	Apr.	19..Additions to drainage pumping station	Sewerage & Water Board.
Ind.	Hartford City	10 a.m., Apr.	20..Ditch construction	F. F. Wallace, Co. Surveyor.
Okl.	Muskogee	2 p.m., Apr.	28..Constructing sewer system for Choctaw Sanitarium	Cato Sells, Comr. Indian Affairs, Washington, D. C.
N. C.	Clinton	Apr.	28..Constructing 5.5 miles vit. sewers 8-12 ins.	A. B. Crumpler, Mayor.

WATER SUPPLY.

Ind.	LaPorte	10 a.m., Apr.	3..3,000 ft. 6-in. c.-i. pipe and fittings	W. F. Kreuger, City Clerk.
O.	Sandusky	noon, Apr.	3..42-inch intake in the bay	J. J. Molter, Dir. Pub. Ser.
Ore.	Eugene	7.30 p.m., Apr.	3..Constructing 2,500,000-gal. reinforced concrete reservoir	C. W. Geller, Secretary.
Ill.	Morris	Apr.	3..Drilling well for city water works	C. Howland, Chr. Committee.
Ind.	Frankfort	Apr.	5..Drilling deep well	John S. Wharry, Twp. Trus.
la.	Newton	Apr.	5..Water works improvement	O. B. Kipp, City Clerk.
B. C.	Victoria	Apr.	5..Fifty 1 to 3-in. water meters	W. Galt, Purchasing Agt.
N. J.	Bloomfield	8 p.m., Apr.	5..152 tons 4 to 8-in. pipe and 2½ tons specials	R. F. Davis, Town Clk.
la.	Morning Sun	7 p.m., Apr.	5..Construction of water system	W. B. Garvin, Town Clk.
Va.	Lynchburg	noon, Apr.	6..Emergency pumping station and pump	Council Comm. on Water
Tex.	Livingston	Apr.	7..Water meters and fire hose	A. T. Feagin, Mayor.
Wis.	Oconomowoc	1 p.m., Apr.	7..Water mains and appurtenances	J. A. Stemper, City Engr.
Pa.	Renovo	Noon, Apr.	7..Two 12-inch wells 130 ft. deep	F. E. Colony, Boro. Engr.
Neb.	Grand Island	2 p.m., Apr.	7..Furnishing 55 tons 12-in. water pipe, lead and jute, and laying about 1,050 ft. 12-in. pipe	H. E. Clifford, City Clk.
O.	Cincinnati	Noon, Apr.	8..Laying cast-iron pipe and other work	Philip Fosdick, Dir. P. S.
O.	Cleveland	Noon, Apr.	8..Furnishing lead pipe	A. R. Callow, Comr. P. & S.
Kan.	McCune	9.30 a.m., Apr.	8..Water works system	W. E. Gracey, City Clk.
N. J.	Clinton	2 p.m., Apr.	9..Extension to water system	Bd. Mgrs. State Reformatory.
Ill.	Cicero	Apr.	12..Laying water main	Chas. Stoffel, Twn. Clk.
Pa.	Punxsutawney	7 p.m., Apr.	12..Erecting pumping station, reinforced concrete reservoir and laying water distributing system	S. B. Long, Sec. Council.
Wyo.	Laramie	Apr.	13..Extension to water works system, includes laying 15,000 ft. 14-in. pipe and 3,200 ft. 12-in.	Z. E. Sezison, City Engr.
Ont.	Toronto	Noon, Apr.	13..Check and automatic valves	T. L. Church, Mayor
N. Y.	Barker	Apr.	14..Constructing water works	W. J. Taylor, City Clk.
Md.	East New Market	Apr.	15..Constructing water works system	F. E. Loomis, Sec. Twn. Comrs.
Minn.	Winona	4 p.m., Apr.	15..Drilling four artesian wells	Board of Municipal Work.
La.	Vivian	Apr.	16..Water works construction	J. D. Houston, Clerk.
Tex.	San Antonio	4 p.m., Apr.	19..Building 60-in. steel flume across river	Fred Fries, City Clk.
Gal.	Jefferson	Apr.	19..150 tons c.-i. pipe, hydrants, filters, pumps, etc.	Homer Hancock, Clerk.
La.	New Orleans	Apr.	19..Additions to pumping station	Sewerage & Water Board.
O.	Oxford	Noon, Apr.	19..2,000 ft. 4-in. c. i. pipe, 3 hydrants and galvanized pipe	Board Public Affairs.
O.	Cleveland Heights	Noon, Apr.	19..Laying 6-in. water mains	H. H. Canfield, Vil. Clk.
Cal.	Sacramento	Apr.	20..Furnishing and installing riveted steel and c.-i. pipes, valves, hydrants, etc.	M. J. Desmond, City Clerk.
Okl.	Muskogee	2 p.m., Apr.	28..Water system for Choctaw Sanitarium	Cato Sells, Comr. Indian Affairs, Washington, D. C.
Mo.	Kansas City	2 p.m., May	5..20,000,000-gallon centrifugal pump	J. R. Langan, Pur. Agt.

LIGHTING AND POWER

Pa.	Pittsburgh	Noon, Apr.	3..Electric light plants	Capt. H. C. Fisk, U. S. Engrs. Office.
D. C.	Washington	Apr.	3..Electric substation	Supt., Coast & Geodetic Sur.
Minn.	Duluth	8 p.m., Apr.	5..Furnishing three gas storage tanks	C. T. Harding, Engineer.
la.	Ames	7 p.m., Apr.	5..Electric work on city hall	A. B. Maxwell, City Clerk.
Pa.	Pittsburgh	Noon, Apr.	5..Two boilers; two pumps	Harold C. Fiske, Captain, U. S. Engrs. Office.
D. C.	Washington	10 a.m., Apr.	6..Electric equipment	S. McGowan, Paymaster Gen'l.
N. D.	Kinston	Apr.	6..Electric light plant improvements	F. I. Sutton, Mayor.
Que.	Montreal	Apr.	6..Furnishing and installing lamps and lamp standards	Supt. of Purchases.
Ind.	Greenfield	Apr.	7..One engine or turbine with direct-connected 180-kva A. C. generator	E. C. Wolf, Supt. County Auditor.
N. D.	Bismarck	3 p.m., Apr.	7..Installing electric light plant in the Court House	P. Fosdick, Dir. P. S.
O.	Cincinnati	Noon, Apr.	8..Constructing and delivering horizontal turbine water wheel	Bd. Mgrs. State Reformatory.
N. J.	Clinton	2 p.m., Apr.	9..Electric transmission line	E. P. Hill, City Clk.
Ill.	Springfield	2 p.m., Apr.	12..One turbo generator complete	City Engineer.
Minn.	Mankato	Apr.	12..Lamps for White Way	Board of Works.
Ind.	Ft. Wayne	Apr.	13..Boiler for city plant	County Comrs.
Fla.	Tavares	Noon, Apr.	15..Removing 1,652 ft. pole iron	Board Public Affairs.
O.	Oxford	Noon, Apr.	19..Two horizontal tube boilers complete	W. F. Ashton, Twn. Clk.
la.	Larchwood	1 p.m., Apr.	21..Electric lighting system	

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
FIRE EQUIPMENT.				
N. J.	Deal	Apr.	3.. Fire alarm telegraph system	Clem Conover, Boro. Clk.
N. Y.	Syracuse	Apr.	5.. Alterations and additions to engine house	R. D. Roney, Sec. Bd. C. & Sup.
Cal.	San Jose	Apr.	5.. Fire apparatus	Town Trustees.
Cal.	Fresno	Apr.	5.. Furnishing motor pumping engine tractor drawn steamers and motor hose cars	W. H. Ryan, City Clk.
N. Y.	Canandaigua	Apr.	5.. Furnishing 1,000 feet of hose	W. N. Brooks, City Clk.
Ill.	Belvidere	8 p.m., Apr.	5.. Motor driven combination chemical and hose	F. L. Shattuck, City Clk.
Pa.	Plains	7.30 p.m., Apr.	5.. Combination motor truck	Wm. Rowlands, Sec., Wilkes-Barre.
Wis.	Fond du Lac	2 p.m., Apr.	6.. Police signal equipment	A. E. Hohensee, City Clk.
N. Y.	Plattsburgh	Apr.	6.. Automobile triple combination	Common Council.
D. C.	Washington	10 a.m., Apr.	6.. Hose	S. McGowan, Paymaster Gen'l.
S. C.	Charleston	Apr.	7.. Motor triple combination	Louis Behrens, Chief.
Wash.	Puyallup	Apr.	7.. Automobile fire truck, 1½ ton	City Council.
Mass.	Pittsfield	Apr.	8.. 1,000 feet 2½-inch hose	Fire Department Com.
Ark.	Russellville	Apr.	8.. Combination chemical and hose	R. R. Taylor, City Clk.
Ill.	Oak Park	Apr.	10.. Motor driven triple combination and motor driven aerial	W. F. Sargent, Comr. P. Wks.
N. Y.	White Plains	Apr.	15.. Construction of fire station	Board of Fire Comrs.
Wash.	Puget Sound	10 a.m., Apr.	20.. 400 ft. of 1¼-in. rubber hose	Navy Pay Office, Seattle.
D. C.	Washington	Apr.	24.. Remodeling fire alarm system at New York Navy Yard	Bureau of Yards & Docks.
BRIDGES.				
Ill.	Joliet	2 p.m., Apr.	3.. Constructing four reinforced concrete bridges	W. H. Smith, Co. Hwy. Supt.
Ont.	Burford	Apr.	3.. 60-ft. steel highway bridge	T. W. Taylor, Cathcart.
O.	Tiffin	Apr.	3.. Construction of two bridges	County Commissioners.
Ill.	Bloomington	1 p.m., Apr.	3.. Constructing steel bridge to cost about \$4,650	R. O. Edwards, Co. Sup. Hwy.
Minn.	Mountain Lake	Apr.	3.. Bridge construction	Township Clerk.
N. J.	N. Brunswick	2.30 p.m., Apr.	5.. Building concrete and steel bridge	A. J. Gebhart, Director.
Ind.	Greencastle	Apr.	5.. Four bridges to cost \$12,300	C. L. Airhart, Co. Aud.
Miss.	Tupelo	Apr.	5.. 60-foot span steel bridge and one car of I beams and channels	County Clerk.
Kan.	Osborne	Noon, Apr.	5.. Constructing 16-ft. stone arch bridge	John Doane, Clerk.
Va.	Stuart	Apr.	5.. Constructing 100-ft. span steel bridge	County Clerk's Office.
Okla.	Chandler	2 p.m., Apr.	5.. Constructing three steel bridges	J. C. Pringle, Clerk.
Mont.	Troy	Apr.	5.. Bridge across Lake Creek	L. G. Klenck, Co. Clerk.
Cal.	Redwood City	Apr.	5.. Three-span concrete bridge	County Commissioners.
Ind.	Scottsburg	1 p.m., Apr.	5.. Constructing two steel and several concrete bridges	Robert Blunt, Co. Aud.
Ind.	Paoli	2 p.m., Apr.	5.. New bridge floor	E. A. Palmer, Auditor.
N. M.	San Marcial	Apr.	5.. 450-ft. span pony truss steel bridge	Co. Comrs., Sosorro.
O.	Warren	1 p.m., Apr.	5.. Bridge over Mahoning River	W. R. Harrington, Co. Aud.
Ind.	Greenfield	10 a.m., Apr.	5.. Bridge construction	Lawrence Wood, Co. Aud.
Wash.	Everett	Apr.	5.. Constructing approach to bridge	County Commissioners.
Cal.	Colusa	Apr.	6.. 37 concrete bridges, 6 to 2,600-ft. span	J. W. Kaerth Eng. Co., Supv.
La.	Lake Charles	10 a.m., Apr.	6.. Steel highway bridge over Black Bayou	Police Jury, D. C. House, Clk.
N. D.	Bathgate	2.30 p.m., Apr.	6.. Constructing seven bridges	W. W. Felson, Co. Aud.
S. D.	Leola	3 p.m., Apr.	6.. 12 to 72-inch galvanized corrugated steel culverts	J. R. Wittmayer, Co. Aud.
N. D.	Jamestown	2 p.m., Apr.	6.. Corrugated galvanized metal steel culverts	County Auditor.
N. D.	Ypsilanti	2 p.m., Apr.	6.. 80-foot steel bridge over James River	County Auditor.
N. C.	Durham	2 p.m., Apr.	6.. Four steel bridges with concrete substructures, to cost about \$5,000 each	F. C. Crompton, Co. Aud.
Fla.	Clearwater	Apr.	6.. 1,256 ft. 12 to 72-in. corrugated iron culverts	C. McMullen, Co. Hwy. Engr.
Minn.	Jackson	1 p.m., Apr.	6.. Six reinforced concrete bridges, 17 to 40-ft. span	P. D. McKellar, Co. Aud.
N. D.	Devils Lake	2 p.m., Apr.	6.. Four reinforced concrete bridges 12 to 16-ft. span	J. A. Kramer, Co. Aud.
W. Va.	Smithfield	Apr.	6.. Steel or concrete bridge	S. Myers, Clerk.
Ind.	Logansport	Apr.	6.. Two reinforced concrete bridges to cost about \$700	A. P. Flynn, Auditor.
Minn.	Virginia	8 p.m., Apr.	6.. Corrugated pipe for 12 culverts	A. D. Bickford, City Clk.
Mich.	Jackson	Apr.	6.. Building steel or concrete bridge over Grand River	A. W. Hall, City Engr.
N. D.	Hillsboro	2 p.m., Apr.	6.. Building steel, concrete and wooden bridges	N. O. Lindass, Co. Aud.
N. D.	Bismarck	2 p.m., Apr.	7.. Three concrete culverts	T. E. Flaherty, Co. Aud.
Mich.	Benton Harbor	Apr.	7.. Reinforced concrete bridge	E. Spaulding, City Clk.
O.	Columbus	Noon, Apr.	7.. Reinforced concrete bridge	County Commissioners.
la.	Sibley	1 p.m., Apr.	7.. Two steel and 36 cement bridges	D. W. Clayton, Co. Aud.
N. D.	Bismarck	2 p.m., Apr.	7.. Constructing bridge approaches	T. E. Flaherty, Co. Aud.
Cal.	Visalia	Apr.	7.. Bridge construction	Board Supervisors.
la.	New Hampton	1.30 p.m., Apr.	7.. Five steel truss bridges and steel for ten I-beam bridges	P. E. McGinn, Auditor.
Kan.	Jetmore	Noon, Apr.	7.. Bridge construction	J. W. Thornburgh, Co. Clk.
Calif.	Hanford	Apr.	7.. Bridge construction	Ben. Duffield, Co. Sur.
Wash.	Hoquiam	Apr.	7.. Repairs to bridge	Comr. Public Works.
la.	Clinton	2 p.m., Apr.	7.. Constructing 25 bridges, estimated cost \$25,000	F. G. Hansen, Co. Aud.
O.	Akron	11 a.m., Apr.	8.. Filling approaches to bridges	C. L. Bower, Clk.
Ind.	Crown Point	10 a.m., Apr.	8.. Tubular iron bridge	Edw. Simon, Auditor.
Minn.	Rush City	1 p.m., Apr.	8.. Reinforced concrete bridge on state road	A. F. L. Stromgren, Co. Aud.
Ind.	Evansville	10 a.m., Apr.	9.. Constructing several steel and reinforced concrete bridges	C. P. Beard, Co. Aud.
R. I.	Newport	11 a.m., Apr.	10.. Erecting and delivering one moveable bridge	H. R. Stanford, Chief Bureau, Washington, D. C.
Minn.	Blue Earth	1 p.m., Apr.	12.. State culverts and bridges	C. L. Kennedy, Co. Aud.
O.	Akron	11 a.m., Apr.	12.. Culvert construction	C. L. Bower, Clk.
Wyo.	Yellowstone Park	Apr.	12.. Constructing steel highway bridges	A. A. Fries, Maj. of Engrs.
N. J.	N. Brunswick	2.30 p.m., Apr.	12.. Building concrete culvert	Thos. H. Hagerty.
Tex.	Robert Lee	Apr.	12.. Constructing two bridges to cost about \$8,000	S. B. Kemp, Co. Judge.
Mont.	Columbus	10 a.m., Apr.	12.. Five reinforced concrete bridges, 22 to 95 ft. long	Board of Co. Comrs.
Mo.	Rockport	2 p.m., Apr.	12.. County bridge construction	J. A. Krusor, Co. Hwy. Engr.
Minn.	Stillwater	10 a.m., Apr.	12.. Five bridges, 22 to 95 ft. span	L. B. Barnes, Co. Clk.
N. J.	Camden	11 a.m., Apr.	12.. Two reinforced concrete bridges	Fred. W. Gercke, Chm. Comm.
Mo.	Rockport	2 p.m., Apr.	12.. Bridge construction	J. A. Krusor, Co. High. Engr.
Wash.	Marysville	Apr.	12.. Reinforced concrete or steel viaduct on Pacific highway	H. Mumm, Jr., Co. Engineer, Everett.
La.	Baton Rouge	noon, Apr.	13.. One steel and one wooden bridge	F. A. Woods, Secy. Police Jury.
Minn.	Chaska	Apr.	13.. Corrugated metal culvert	J. B. Connolly, Auditor.
Ill.	Custer Park	2 p.m., Apr.	13.. Constructing four reinforced concrete bridges	W. H. Smith, Co. Hwy. Supt.
O.	Cambridge	Apr.	13.. Bridge over Willis Creek	P. C. White, Co. Aud.
O.	Canton	Noon, Apr.	13.. Building superstructure and abutments for bridge	T. C. White, Aud.
O.	Canton	10 a.m., Apr.	14.. Bridge over Pigeon Run	C. L. Stoner, Clk. Co. Comrs.
O.	Cleveland	10 a.m., Apr.	14.. Bridge construction	E. G. Krause, Clk. Co. Comrs.
Pa.	Ebensburg	noon, Apr.	14.. Constructing 96-foot concrete arch bridge	G. M. Wertz, Co. Controller.
Fla.	Tavares	Noon, Apr.	15.. Raising 57 bridges	H. H. Duncan, Clerk.
O.	Bryan	1 p.m., Apr.	15.. Steel bridge construction	W. H. Davis, Co. Engr.
Minn.	Windom	1 p.m., Apr.	15.. Furnishing corrugated culverts	S. A. Brown, Co. Aud.
Kan.	Atchison	Apr.	16.. Three concrete bridges	S. K. McCrary, Engr.
O.	Hamilton	Apr.	17.. Concrete bridge 600 feet long, to cost \$85,000	W. W. Crawford, Co. Aud.
Ind.	Danville	10 a.m., Apr.	19.. Constructing 7 steel and 9 concrete bridges	L. W. Borders, Co. Aud.
Ala.	Goshen	Apr.	21.. Building steel concrete bridge over river	Co. Comrs., Troy.
O.	Bryan	1 p.m., Apr.	23.. Building several bridges	C. R. Lowe, Co. Aud.
Ky.	Litchfield	Apr.	27.. Bridge 85 feet long	Ed. Butler, Co. Rd. Engr.
la.	Sioux City	10 a.m., Apr.	27.. Furnishing two culverts	P. J. Wells, City Clk.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
MISCELLANEOUS				
Pa., Matamoras	noon, Apr.	3.. Concrete block Borough Building.....	F. W. Kesting, Secy.
Ill., Rock Island	2 p.m., Apr.	3.. 12-ton garbage incinerator.....	M. T. Rudgren, City Clk.
Pa., Titusville	Apr.	5.. Three dozen waste receptacles.....	W. M. Dame, City Clerk.
N. Y., Albany	Apr.	5.. Shade trees for planting along streets.....	Bd. of Contract & Supply
Ia., Ames	7 p.m., Apr.	5.. Erecting of two-story city hall.....	A. B. Maxwell, City Clk.
Que., Westmount	Noon, Apr.	5.. Furnishing cement, stone and pipe for one year.....	Secretary of City Council.
Ill., Chicago	11 a.m., Apr.	5.. Crushed limestone.....	L. E. McGann, Comr. P. W.
Cal., Los Angeles	10 a.m., Apr.	5.. Rubbish, salvage concession.....	Board of Public Works.
Minn., St. Paul	10 a.m., Apr.	5.. 48,000 cement blocks for crosswalks repairs.....	Aug. Hohenstein, Pur. Agt.
Md., Dickerson	Apr.	5.. Quarrying and crushing trap rock and furnishing broken stone.....	Dist. Comrs., Wash., D. C.
N. Y., Albany	3 p.m., Apr.	5.. Furnishing and planting trees on State Street.....	I. Wachsmann, Sec. Bd. C. & S.
D. C., Washington	2 p.m., Apr.	6.. Broken stone.....	District Commissioners.
Utah, Salt Lake City	10 a.m., Apr.	6.. Constructing concrete retaining wall.....	K. A. Shield, City Recorder
N. Y., Schenectady	2.30 p.m., Apr.	7.. Collecting and removing garbage, ashes and rubbish for five years.....	Deputy City Engineer.
Ind., Crown Point	Apr.	9.. Broken stone and screenings.....	Edward Simon, Co. Aud.
Mo., St. Louis	Noon, Apr.	9.. Furnishing and driving about 15,000 ft. reinforced concrete piling.....	Board Public Service.
N. J., Irvington	3.30 p.m., Apr.	12.. Sixteen or more motor cycle.....	Board of Police Comrs.
Ky., Somerset	8 p.m., Apr.	12.. Franchise for telephone system.....	J. L. Waddle, Mayor.
Utah, Salt Lake City	Noon, Apr.	12.. Chauffeurs' badges and motor cycle and automobile number plates.....	David Matson, Sec.
D. C., Washington	Apr.	13.. Supplies for Navy Department.....	Bureau of Sup. & Accounts.
O., Toledo	Noon, Apr.	13.. Furnishing cut stone work and metal window frames.....	A. W. Boardman, Dir. P. Serv.
Conn., Waterbury	8 p.m., Apr.	14.. Constructing masonry channel 300 ft. long.....	R. A. Cairns, City Engr.
N. Y., Buffalo	11 a.m., Apr.	15.. Dredging in Niagara River.....	Col. J. G. Warren, U. S. Engr.
Ky., Louisville	Noon, Apr.	19.. Furnishing and delivering Portland cement.....	Maj. J. C. Oakes, U. S. Engr.
Mo., St. Louis	Noon, Apr.	19.. Furnishing and driving about 15,000 ft. reinforced concrete piling for municipal bridge construction.....	Board Public Service.
S. C., Charleston	7 p.m., Apr.	20.. Furnishing brick, lime, Portland cement, curbing, terra cotta pipe, and crushed rock, and laying and placing concrete sidewalks, sewer pipe and stone curbing.....	J. H. Dingle, City Engr.
O., Tiffin	Noon, Apr.	20.. Deepening, widening and straightening Sandusky River.....	Wm. Heller, Dir. P. S.
D. C., Washington	Apr.	20.. Supplies for Navy Department.....	Bureau of Sup. & Accounts.
N. Y., New York	Apr.	20.. Section 2 subway construction.....	Public Service Commission.
O., Cleveland	May.	25.. Steel reinforcing bars.....	Comr. Pur. & Supp.
D. C., Washington	Apr.	27.. Supplies for Navy Department.....	Bureau of Sup. & Accounts.

STREETS AND ROADS

Birmingham, Ala.—Board of Revenue was petitioned by delegation to construct boulevard from end of new viaduct on 1st Ave. to the county line by way of East Lake and Roebuck Springs.

Russellville, Ark.—The preliminary legislation has been passed by city council to form first street paving improvement district in Russellville for purpose of paving four miles of streets.

Auburn, Cal.—Trustees are unanimous for paving of main business streets, and this work is to be undertaken immediately under Vrooman Act. City will pave intersections, and the property owners will pave to middle of streets where they do not exceed 50 ft. in width.

Hollister, Cal.—By unanimous vote board of town trustees has decided on paving Monterey and South Sts this summer.

Red Bluff, Cal.—In addition to four blocks in business section of Main St., Red Bluff, it is probable the entire street of 14 blocks will be paved. Main St. is on route of State Highway through the city.

Pasadena, Cal.—There were five bidders for Worcester Ave. contract of paving, curbing, guttering and oiling that street from Colorado St. north, as follows: A. C. Hughes, paving, 20 cents a square foot; curbing, 27 cents a linear foot; gutter, 16 cents a square foot; oiling, 10 cents a square foot. Andrew Holloway, 19, 27, 14 and 9 cents, respectively. California-Arizona Construction company, 23 1/4 cents for paving, 11 1/2 cents for oil macadam, 30 cents each for 12 or 16-inch curb and 16 cents for guttering. Hart & Darcey offered to pave for 18.5 cents, curb for 24, gutter for 15 and oil for 10.5 cents. H. E. Cox offered to pave for 17.5 cents, curb for 26 cents, gutter for 15 cents and oil for 10 cents. All bids were referred to Commissioner Allin to be figured out to see who is low man.

Sacramento, Cal.—The construction of 21-mile section of State highway along east base of Sierra Nevada Mountains through Bridgeport and Markleeville to Lake Tahoe is recommended.

San Diego, Cal.—The San Diego County Supervisors have authorized representative at Sacramento to buy \$250,000 State highway bonds with county surplus funds.

Stamford, Conn.—Improvement of Shippin Ave. by means of a tarvia road, to cost about \$20,000, the money to be raised by general taxation, will be recommended to Common Council, at its next meeting, by Street Committee, of which Charles D. Vuono is chairman.

Waterbury, Conn.—State Highway Commissioner has opened bids which he

has received for certain work planned for coming season, which includes laying of 10,000 lin. ft. of gravel construction for proposed improvement of Thomaston Ave., known as lower Waterville Rd. Road will be made 26 ft. wide from West Main St. to plant of Berbeck & Rowland Co., in Waterville.

Elkton, Del.—A petition is being largely signed in Elkton, requesting Cecil County Commissioners to build permanent road from Elkton toward Glasgow to Delaware State line.

Jacksonville, Fla.—Board of County Commissioners has rescinded \$1,000,000 bond issue and set of introduced resolutions was adopted, providing for forms and specifications for the hard surfacing of ten roadways and the resurfacing of fourteen other highways, bids to be opened April 8.

Edwardsville, Ill.—A rock roadway is to be constructed on Hillsboro Rd. and bids are now being advertised for. Contract will be awarded on April 5.

Peoria, Ill.—Five proposals have been received on State-Second paving contract, bids for which were opened. The contract is for the paving of parts of North Second, Third, Margaret, Ann Eliza, Caroline, Catherine and State Sts., and there are 23,790 square yards of pavement in the district. The material is to be brick on concrete base with asphalt filler. The figure on the paving includes 10,660 yards of excavating and filling. There are also 3,450 feet of new 6x20 concrete curb, 1,500 feet of protection curb and 9,000 feet of old curb to reset. The bids on the work were as follows: Jansen & Zoeller, Pekin—Pavement, per yard, \$1.76; new curb, 25c per foot; protection curb, 27c; reset, 10c. Barnswolt Construction Co., Peoria—Pavement, \$1.78; curb, 24c; protection, 22c; reset, 9c. Charles T. McElwee, Peoria—Pavement, \$1.80 1/4; new curb, 29c; protection, 30c; reset, 13 1/2 c. McCalman Construction Co., Decatur—Pavement, \$1.80 1/2; new curb, 35c; protection, 30c; reset, 15c. D. A. Myers, Peoria—Pavement, \$1.82; new curb, 35c; protection, 30c; reset, 15c. The figuring of the Jansen & Zoeller and the Barnswolt bids, the lowest received, showed only a difference of \$188.30 on the total, Jansen & Zoeller's figure being \$44,076.90 and Barnswolt's \$44,265.20. Bids will be taken under advisement, and contract let later.

Fort Wayne, Ind.—Board of Works has compiled bids submitted on paving of Lillie St. The Grace Construction Company bid \$5.97 a linear foot for paving with Trinidad Pitchlake asphalt with stone curb and \$5.52 with cement curb, \$5.59 for Texaco with stone curb and \$5.19 with cement curb, \$5.74 for California sheet asphalt with stone curb and

\$5.30 with cement curb and gutter, \$5.62 for Mexico with stone curb and \$5.22 with cement, \$5.64 for Bermudez Lake asphalt with stone curb and \$5.22 with cement curb. On Metropolitan brick, with stone curb, and concrete foundation the C. E. Moellering Company bid \$6.19 and Brooks Construction Company \$6.22; with cement curb, Moellering \$5.56 and Brooks \$5.54. Moellering bid \$6.24 for Puritan with concrete foundation and stone curb and \$5.41 for cement curb, \$5.04 for concrete with stone curb and \$4.56 for cement curb and gutter. George H. Krudop bid \$6.24 for Metropolitan with concrete foundation and stone curb and \$5.64 for cement curb and gutter, \$5.35 with rolled stone foundation and stone curb and \$4.72 for rolled stone and cement curb.

Indianapolis, Ind.—Reisner St. is to be paved with asphalt from Morris St. to Howard St. The Board of Works to-day has confirmed resolution for the improvement.

Muncie, Ind.—Ordinance may be brought up before members of city council at some near date calling for appropriation with which to buy new power street flusher.

Plymouth, Ind.—The county treasurer has sold \$91,500 20-year improvement bonds at par and interest, 4 1/2 per cent. Money will be used for construction of 11 gravel roads in German township, Marshall county, of 25 1/2 miles. Purchaser was C. A. Reeve, of this city, who represents an Indianapolis bonding house.

Richmond, Ind.—An amended resolution providing for paving of South A St. from 5th to 16th Sts. has been confirmed by Board of Public Works by unanimous vote, and resolution referred to Council for final decision.

South Bend, Ind.—Resolution has been passed for paving of Mishawaka Ave. from Eddy to 19th St.

Council Bluffs, Ia.—Alderman Harding has asked for purchase of additional street flusher and Council sent request to committee of whole. It was stated that flushers will take place, in large measure, of sprinklers this summer.

Dubuque, Ia.—Council is considering question of purchasing street sweeper and road roller.

Waterloo, Ia.—Property owners on Baltimore St. have petitioned Council to order street paved with asphalt from Pleasant St. to lot 9 in Reitzel's outlots. Petition has been referred to street alley committee.

Ottawa, Kan.—Bids will be received at office of City Clerk until 1 p. m., April 8, for about 9,800 lin. ft. combined concrete curb and gutter and 12,900 sq. yds. brick pavement. B. W. Harris is City Clerk.

Salina, Kan.—Ordinance has been passed providing for paving, curbing, guttering and excavating of 13th St., in City of Salina, Kan., between north line of Ash St. and north line of Bishop St. extended due west from 9th St., and providing for the cost thereof.

Lagrange, Ky.—The Oldham Fiscal Court has directed Sheriff Anderson to order election on April 20 to be held in each precinct of county on proposition to issue \$100,000 in bonds for road purposes.

Whitesburg, Ky.—Arrangements have been made by Letcher Fiscal Court to expend \$25,000 in good road building in county, the most of the money to be expended between this city and Fleming, in heart of coal fields—the work to be done this year.

Biddeford, Me.—The Biddeford city government has voted bond issue of \$50,000 for permanent street improvements.

Baltimore, Md.—Alexander Brown & Sons have been awarded the \$150,000 city of Cumberland (Md.) 4½ per cent paving bonds at meeting of Commissioners of city of Cumberland.

Hagerstown, Md.—The State Roads Commission will in near future award contracts for oiling State roads system of about 475 miles.

Chicopee, Mass.—Following appropriations have been made for street improvements: Exchange St., Miller St. to Dwight St., permanent paving, \$18,000; Hampden St., Center St. to top of hill, granite block, \$3,500; Springfield St., South St. to Luddens, west side, macadam, \$4,920; Springfield St., South St. to Luddens, both sides, macadam, \$11,520; Springfield St., Luddens to Springfield line, east side, macadam, \$5,000; Howard St., Springfield St. to School St., macadam, \$1,100; School St., Gilmore St. to Center St., macadam, \$950; Center St., School St. to Market Sq., permanent paving, \$6,500; Front St., Orchard St. to Academy St., macadam, \$9,000; St. James Ave., Broadway to Springfield line, macadam, \$5,500; Church St., Grove St. to Court St., macadam, \$5,000; East Main St., Broadway to Belcher St., granite block, \$3,200; East Main St., Belcher St. to end of present macadam, macadam, \$1,000; Sheridan St., Montgomery St. to Fuller Rd., macadam, \$4,500 (this estimate will only do about one-half of the distance stated); Fuller Rd., from end of present macadam to top of hill, \$1,000; Columba St., Ward St. to Grattan St., macadam, \$2,500; Grattan St., Amherst Power Co. plant to Tribby Ave., macadam, \$4,200; Grattan St., Providence St. to Olea St., macadam, \$2,000; Grattan St., Olea St. to Meadow St., \$9,000; Chicopee St., Margaret St. to Prospect St., east side, macadam, \$6,000; Chicopee St., Adams St. to Boston and Maine station, west side, macadam, \$3,200; total, \$108,090.

Lawrence, Mass.—Purchasing Agent McConnor has received following bids upon edgestone for street department: Frank Mallory, Lowell, 42 per ft.; Lovejoy Granite Co., Milford, N. H., 39; John Marinal, No. Chelmsford, 44; P. A. Carlin, Graniteville, Mass., 41; Thomas Rafferty, Lowell, 40½; Lewis B. Palmer, Graniteville, 38. Contracts will be awarded to Lewis B. Palmer at 38 cts. Contract calls for delivery of 5,000 to 30,000 ft.

Lowell, Mass.—The \$75,000 order for granite block paving has been passed and Council then proceeded to discuss \$50,000 order for macadam paving under specifications to be approved by Massachusetts Highway Commission. The order was finally passed.

Springfield, Mass.—Following bids have been received for 1915 supply of cement for street construction. Bids were as follows: Springfield Contractors' Supply Co., for delivery at the Summer St. yard, bid \$1.52 per barrel; for delivery on the job, \$1.62 per barrel. The New England Pulp Plaster Co. bid \$1.5475 and \$1.6875 for delivery after June 1, with 2 per cent off for payments on regular city pay days. Delivered before June 1, the price at the Summer St. yards would be \$1.6375. T. Shea bid \$1.65 with a discount of two cents. Harder Coal & Grain Co. bid \$1.55 in carload lots, or \$1.65 in smaller lots at the Summer St. yard, and \$1.70 on the job. The Knickerbocker Portland Cement Co. bid \$1.50 at the yard in carload lots and \$1.65 on the job with a discount of two cents for payment within 10 days. The H. C. Puffer Co. bid \$1.60 in carload lots at the yard and \$1.72 on the job.

Springfield, Mass.—Following is list of streets where new or relaid pavement has been decided upon, and approximate

cost: Water St. underpass, \$27,800; Fulton St., \$17,150; Main St., at west side of the Main St. green, Emery to Sergeant Sts., \$16,975; Roseland St., \$3,713; Farnsworth St., from Hamburg St. to the city line, \$3,175; Moreland Ave., \$5,600; Stafford St., \$1,747; Liberty St., from the end of the bitulithic pavement to Chestnut St., \$15,191; Dwight St. underpass, \$7,332; Hillman St. extension, \$4,780; Dwight St. extension, \$8,330; Bloomfield St., \$7,176; Whittier Ave., \$5,179; Chester St., \$2,409; Charter Ave., \$1,912; Dunmoreland Ave., \$5,512; Albemarle Ave., \$5,567; Rochelle St., \$3,177; Oak Grove Ave., from Burr to Bay St., \$6,591.

Bay City, Mich.—At next meeting of board of public works City Engineer Henry C. Thompson will probably lay before board his report as to cost and erection of new street signs for city. It is now plan of board to erect signs on angle-iron posts, about 1,000 of these to be used throughout the city.

Kalamazoo, Mich.—Kalamazoo will spend \$88,000 for paving operations this year. Work will start early next month as soon as necessary bonds can be sold. City council has adopted vote of street committee and voted to pave following streets: Brick Pavement—West Main St., Mount Home Cemetery gate to city limits; North Edwards St., M. C. R. R. to Ransom St.; Grace St., Portage to Pitcher St.; Portage St., Bryant to Alcott St. Asphaltic Concrete—North Park St., Main to Kalamazoo Ave.; East Vine St., John to Jasper St.; East Dutton St., Burdick to John St.; John St., Walnut to Vine St.; Davis St., Lovell to Cedar St. Curb and Gutter—North Park, North to Patterson St.

Saginaw, Mich.—The paving of 12 streets which will aggregate 2½ miles in length has been ordered by Council and work will be commenced as soon as possible. Resolutions were from Department of Public Works, of which George Holcomb is Commissioner. The contracts will reach about \$125,000. All will be of asphalt paving, except Washington, which will be of creosote block, and Jefferson, between the C. S. & M. tracks and Rust St., which will be of brick.

Duluth, Minn.—Resolution ordering improvement of 22d Ave. west, from Superior to 3d Sts., has been introduced by Commissioner Murchison. Resolution authorizes grading of the thoroughfare to a width of 34 ft.

Duluth, Minn.—City Council will order paving of 6th St., between 15th and 18th Aves. east, and 16th Ave. east from 6th to 7th Sts. Commissioner Murchison is preparing resolution, ordering improvement of East 6th St. and the one block on 16th Ave. some time this spring, the work to be done by day labor. An 80 per cent advance assessment will be levied. Petitions for improving of two streets are now on file with city clerk, and it is expected that no opposition will develop after work is ordered. It is estimated that the pavements will cost about \$17,000.

Duluth, Minn.—Highland St., from 59th to 66th Ave. west, will be first highway improved by division of public works this year.

Chillicothe, Mo.—Petitions have been presented for paving of Bryan St. from Walnut to Fair St. with brick, 24 ft. wide on 4-in. concrete base. Another petition was presented for the paving of the same street from Fair to Cemetery Lane 20 ft. wide with brick on a 4-in. macadam base. Petitions have been accepted and city engineer instructed to prepare plans and specifications for the improvement. Two more petitions for paving of Cherry St. from Polk to 3d St. were presented to Council. The property owners on the street from Polk to Clay want Tarvia and from Clay to 3d brick. The pavement is to be 24 ft. wide. City engineer was instructed to prepare plans and specifications for the paving. Property owners on Easton Ave. were in line with petition asking for paving of that avenue from Polk to Calhoun St. 24 ft. wide with brick. Plans and specifications for the improvement of the street will be prepared by the city engineer. Plans and specifications for the paving of South Washington St. from Clay to Wabash right-of-way were accepted and resolution ordering city auditor to advertise for bids for work was passed and approved.

Maryville, Mo.—The paving of probably 26 city blocks on seven different streets of Maryville with bituminous concrete will likely be ordered done this spring by City Council.

St. Louis, Mo.—Board of Public Service is considering following improvements:

The improvement of Colorado Ave. from Kansas St. to Bates St., including grading of the sidewalk spaces. Estimated cost to property owners: Brick pavement, \$28,050; rate per front foot, \$2.15; rate per 100 square feet, \$2.05. Asphalt or bitulithic pavement, \$26,623; rate per front foot, \$2.04; rate per 100 square feet, \$1.95. The improvement of Berlin Ave. from Union Boulevard to De Baliviere Ave. Estimated cost to property owners: Wood block pavement, \$27,836; rate per front foot, \$1.54; rate per 100 square feet, \$1.72. Asphalt or bitulithic pavement, \$21,988; rate per front foot, \$1.22; rate per 100 square feet, \$1.36. The improvement of Pattison Ave., from Kingshighway Boulevard to Macklind Ave., including the grading of the sidewalk spaces. Estimated cost to property owners: Brick pavement, \$34,370; rate per front foot, \$2.18; rate per 100 square feet, \$2.84. Asphalt or bitulithic pavement, \$34,003; rate per front foot, \$2.16; rate per 100 square feet, \$2.81. Board's Motion No. 47. The improvement of California Ave. from Osceola St. to Meramec St., including the grading of the sidewalk spaces. Estimated cost to property owners: Brick pavement, \$14,756; rate per front foot, \$2.10; rate per 100 sq. ft., \$3.43. Asphalt or bitulithic pavement, \$13,992; rate per front foot, \$2.00; rate per 100 sq. ft., \$3.25. Board's Motion No. 48. The reconstruction of Vandeventer Ave. from Lindell Boulevard running west of Vandeventer Ave. to Delamar Boulevard. Estimated cost to property owners: Wood pavement, \$12,953; rate per front foot, \$1.84; rate per 100 sq. ft., \$0.47. Asphalt or bitulithic pavement, \$11,224; rate per front foot, \$1.34; rate per 100 square feet, \$0.41. Board's Motion No. 49. The grading of Louisville Ave. from Dale Ave. to Clayton Ave. Estimated cost to property owners: Grading street between building lines, \$10,304; rate per front foot, \$0.97; rate per 100 sq. ft., \$0.60. Grading street between curb lines, \$7,815; rate per front foot, \$0.73; rate per 100 sq. ft., \$0.46.

Helena, Mont.—Arrangements have been completed by Lewis and Clark County Board of Commissioners for construction of new highway west of Helena to Garrison, Missoula, Butte and other places via western route.

Bayonne, N. J.—Bids will be received April 6 for paving 14th St. with sheet asphalt.

East Orange, N. J.—Paving of Central Ave. is being discussed.

Newark, N. J.—Positive assurance has been given by William Cardwell, chairman of road committee of Board of Freeholders, that repaving of South Orange Ave. in Vailsburgh section and of Central Ave. in East Orange, Orange and West Orange, would be included in spring work of county. About \$202,000 has been apportioned from State aid and motor vehicle funds for permanent improvements in Essex County. It was explained by Mr. Cardwell that about \$50,000 of this had been promised by State Road Commissioner Stevens for South Orange Ave. Balance, including \$52,000 owing for recent paving of Pompton turnpike, is for other work done or contemplated by county.

New Brunswick, N. J.—Bids for regulating and grading ten streets have been opened by Common Council and will be acted upon in special session. Percy G. Smith of Bloomfield, N. J., was low bidder but owing to error in specifications contract will probably be awarded to Conrad Sebolti of New Brunswick at bid of \$11,572.25.

Perth Amboy, N. J.—Resolution has been adopted for paving of Lehigh Ave. with granite stone paving block.

Trenton, N. J.—Ordinance has been passed for widening of Garfield Ave.

Trenton, N. J.—The Assembly has passed bill of Senator Gaunt authorizing purchase of turnpike roads in this State by State Road Department and Boards of Freeholders.

Trenton, N. J.—About \$10,000 is available for resurfacing the White Horse Rd. with bituminous concrete. The money will be furnished by the state authorities. It has been decided to advertise for bids for work of resurfacing River Rd., the Trenton-Allentown Turnpike and the Brunswick Pike, proposals to be advertised for after plans and specifications of County Engineer Tobish are approved by the road committee. Road committee has been empowered

to advertise for bids for furnishing of a steam road roller.

Brooklyn, N. Y.—Widening of Jamaica Ave. is being planned.

Brooklyn, N. Y.—It will cost city \$45,000 to fill in Shore Rd. between 94th St. and Fort Hamilton.

Fort Plain, N. Y.—Bids will be advertised for construction of Fort Plain-Hessville State Rd.

Harrietstown, N. Y.—Board has decided to expend \$5,000 for macadam road bed on State Rd. running from Saranac Lake to Coreys.

Hudson, N. Y.—By resolution adopted Assembly will ask constitutional convention, when it meets April 6, to consider advisability of providing further funds, beyond \$50,000,000 bond issue authorized, in order to complete State and county highways of New York.

Hudson, N. Y.—Plans for new State highway to run from Rhinebeck to Millerton are in the making, thus connecting once more Hudson and Harlem valleys.

Lowville, N. Y.—A combination oil and water Studebaker sprinkler for use on village streets has been ordered at cost of \$650.

Middletown, N. Y.—John S. Armstrong, of this city, has been awarded contract to build stretch of roadway extending from Liberty west to county line in Sullivan county, known as part 2. Work of construction will cover 8.51 miles of highway, being known as No. 5234. The work will also include a stretch from Livingston Manor west to the Delaware county line. Contract price was \$37,127.

Niagara Falls, N. Y.—Alderman McGraw has presented resolution at meeting of common council calling on supervisors to order paving of Lockport St. from North Ave. to the east city line, distance of 2 2-10 miles.

Richfield Springs, N. Y.—Village trustees have adopted resolution to be submitted to qualified voters of corporation March 30. The substance of resolution provides for authorization of bond issue to amount of \$35,000, in denominations of \$500 each. The proceeds of sale, if resolution carries, is to be devoted to the construction of bituminous macadam pavement on various streets.

Sayville, L. I., N. Y.—On ballot that will be submitted to voters in Town of Islip, on April 6, are 32 petitions calling for appropriations in various parts of town. The total amount of these is close to \$150,000.

Utica, N. Y.—A copy of the itemized proposal of Joseph Walker Construction Co., of Albany, for improving Durhamville-Rome county highway, 13.73 miles, has been filed with county clerk. The amount of bid is \$121,161.50, work to be completed on or before 325th working day. J. G. Hayes, of Hornell, has also filed proposal to improve Verona-Rome state highway, 5.70 miles, in 200 working days, for \$58,221.25.

Winston-Salem, N. C.—Board of Aldermen has authorized purchase of a street flusher.

Winston-Salem, N. C.—Board of Aldermen has decided to purchase a street flusher which will cost about \$1,500. It will be horse-drawn and is equipped with gasoline motor to maintain sufficient pressure to properly wash streets.

Canal Dover, O.—Bids will be received until noon, April 14, for paving Iron Ave. and Slingluff Ave. W. E. Sykes, clerk.

Canton, O.—Survey will shortly be made on Canton-Cairo Highway Rd. to determine cost of improving same with concrete.

Columbus, O.—Resolutions have been adopted for improvement of various streets by paving, etc.

Coshocton, O.—Resolution has been adopted to improve South 7th St., from Kenilworth Ave. to Bank St., by paving the roadway thereof with hard burned paving brick, setting curbs and constructing the necessary sub-drains and catch-basins.

Groton, O.—Proposition to issue \$25,000 of road improvement bonds has been carried.

Marion, O.—A resolution for paving of North Seffner Ave., from Center St. to the Big Four railroad, has been given three readings and adopted.

Piqua, O.—Resolutions have been adopted for paving of various streets.

Salem, O.—Green township is preparing to sell bonds in sum of \$3,000, it is understood, for improvement of a stretch of road between Columbiana-Mahoning line to New Albany.

Troy, O.—Bids for paving the Adams St. bridge in Troy were as follows: Hennessey Bros., Troy, bituminous macadam, \$809; concrete, \$880; brick, \$1,140. Sweet

ney & McKee, Troy, bituminous macadam, \$798; concrete, \$840; brick, \$949. George Moses, Troy, concrete, \$834. Ed. Yount, concrete, \$860. Question is kind of material to be used and as bids for brick were so much lower than estimate, commissioners are inclined to use it in paving of bridge.

Youngstown, O.—Resolution has been passed to pave Japan St. from Poland Ave. to Homewood Ave. and Homewood Ave. from Japan St. to Campbell St.

Youngstown, O.—Resolutions have been adopted for paving of various streets.

Tulsa, Okla.—About \$300,000 worth of city improvements will be made this year, divided as follows: Street paving, \$225,000; alley paving, \$16,000; sewers, \$25,000; city hall, \$20,000; boulevards, \$10,000; market place, \$6,000, and sidewalks \$5,000.

Pendleton, Ore.—Umatilla county farmers and citizens of Pendleton have subscribed in last two days first \$9,500 of proposed sum of \$100,000 for construction of hard surface highway from Pendleton to Columbia River through Cold Spring country.

Portland, Ore.—To submit to voters of Multnomah county question of a \$1,250,000 bond issue to raise funds for hard surfacing of 73 miles of county roads, a special election will be held April 13.

Salem, Ore.—By unanimous vote State Highway Commission has decided to build link in Columbia river highway at Mitchell Point, Hood River county, and Board will meet and award contract to whoever is considered lowest and most responsible bidder. Commission at time county voted bonds to build Columbia highway through county pledged \$50,000 to build Mitchell Point link.

Harrisburg, Pa.—Appropriation of \$32,000 to enable State Highway Department to take over Chambersburg and Bedford turnpike in Franklin county and highway in Bucks county has been introduced in Senate by Senator Hoke, Franklin county.

Harrisburg, Pa.—Ordinance has been passed to authorize paving and curbing of Brown St. from 17th St. to 18th St., and providing for payment of cost thereof.

Johnstown, Pa.—Residents on Walnut St. are in favor of wood block paving of that street in place of brick.

Lewistown, Pa.—Specifications for Third St. paving have been approved. They call for 4-in. deep brick, an average crown of 6 in. and for asphalt filler between bricks.

Pittsburgh, Pa.—Following the announcement that Allegheny County Commissioners would at once begin construction work involving outlay of \$5,000,000, City Council has agreed with Baltimore & Ohio Railroad and Pittsburgh Railways Co. to begin work on elimination of 33d St. grade crossing at Liberty Ave. Estimated cost is \$500,000. Besides this city will start work of raising all streets between 8th St. and Monongahela and between Allegheny river front and Liberty Ave. Improvement will be started by April 1.

Wilkes Barre, Pa.—As soon as weather permits work on completion of the Wilkes Barre-Hazleton Rd., known as section 2, from Rita to Tunnel will be started, and it is expected work will be finished within two months. The Free-land Construction Co. has contract and there are about 4 miles of roadway to build.

Providence, R. I.—City council finance committee has voted to recommend appropriation of \$45,000 for oiling of macadam streets in city during fiscal year of 1916.

Warwick, R. I.—Senator W. Gordon Reed, 2d, of this town has introduced resolution in Senate appropriating \$200,000 for repairs and reconstruction of State highway extending from Greenwood bridge south to town line at Division St. This piece of road is about 3½ miles in length.

Nashville, Tenn.—The ordinances authorizing issuance of \$430,000 of street improvements bonds has been passed on first reading at adjourned meeting of City Commission.

Dallas, Tex.—A petition filed by property owners on Sycamore St., between Peak and Fitzhugh, asking that street be paved with Uvalde rock asphalt at expense of property owners has been granted by Board of City Commissioners. The city is to pave intersections and to grade the street.

Dallas, Tex.—One bid only was received for paving Orange St. from Ross to McKinney. The bid was filed by Texas Bi-

tulithic Company and was referred to Commissioner Scott for tabulation.

Denton, Tex.—A proposition to furnish \$200,000 for road building in Denton county on county warrants has been submitted to Chamber of Commerce directors for their approval and will be presented to Commissioners' Court at its next meeting.

Fort Worth, Tex.—Petitions have been filed with City Secretary Harwood for paving of East Magnolia Ave. from South Main St. to Evans Ave. and of Lilac St. from College Ave. to 5th Ave.

Fort Worth, Tex.—Paving of three stretches of road connecting city paving with improved highway system of Tarrant county will cost property owners nearly \$35,000, according to terms of only bid filed with City Commission. Summary of bids follows: Haslet Rd., North Main St. from 25th St. to the city limits, \$5,456.25; Azle Rd., Clinton Ave. from 25th St. to Cliff St., Cliff St. from Clinton Ave. to city limits, \$1,543; Mansfield Rd., Yuma Ave. from Allen Ave. to Richmond Ave., Richmond Ave. from Yuma Ave. to Mansfield Rd., Mansfield Rd. from Richmond Ave. to city limits, \$21,935. Roads are to be paved with asphalt macadam, with shoulders of gravel.

Fort Worth, Tex.—Paving of eighteen blocks on three different streets is contemplated in petitions that have been circulated and filed with City Secretary Harwood. Streets are Travis Ave., between Terrell and Magnolia Aves. (51.5 per cent. frontage signed); East Magnolia Ave., Main St. to Evans Ave. (33.5 per cent. frontage signed); Lilac St., between College and Fifth Aves. (86.6 per cent. frontage signed).

Greenville, Tex.—It has been announced that additional street paving contracts would be let here for paving on Bois d'Arc, Mill and Travis Sts. This will bring Greenville's paved mileage up to twenty miles.

Wichita Falls, Tex.—The City Council will award contract shortly for paving of Scott Ave., a semi-business thoroughfare. An extensive paving program has been mapped out, including permanent improvement of many residence streets.

Salt Lake City, Utah.—Paving of portions of seven streets this year is to be recommended to City Commission within a few days by Commissioner R. P. Morris. The city's share of the cost is estimated by city engineer at about \$75,000. Streets Commissioner Morris proposes to recommend for paving are: Eleventh East from Yale to Sugar House, estimated cost to city, \$20,000; Sixth East from 3d South to 9th South, city's cost, \$15,000; B St. from 2d Ave. to 9th Ave., city's cost, \$12,000; 6th Ave. from B to H, city's cost, \$10,000; State from North Temple to 2d North, cost not estimated; North Temple from Main to State, city's cost, \$500; 2d North from Main to East Capitol, no estimate of cost.

Norfolk, Va.—Bids for curbing and curb corners for extension of Olney Rd. have been opened and referred to city engineer by Board of Control as follows: Faith Granite Company, 40c. per foot for curb corners; Linenhan & Son, 39½c. per foot for curbing, and \$4 per set for corners; Perry W. Ruth & Co., for Wise Granite Co., 49c. per foot for curbing and 59c. per foot for corners.

Parkersburg, W. Va.—The Fifth Third National Bank of Cincinnati was successful bidder on \$200,000 coupon bond issue for street improvement in Parkersburg at bid of \$3,863 premium par and accrued interest.

Chehalis, Wash.—The Lewis County commissioners have decided to build half a mile of crushed road up Coal Creek Valley, east of Chehalis. In addition 2,000 ft. of plank road will be built. Roads will serve two of local coal mines.

Everett, Wash.—One of earliest street improvements activities will be on Fulton St., from Everett Ave. to Twenty-first St., a distance of six blocks. Council has authorized Clerk Lesh to advertise for bids, receivable up to 10 a. m. March 29.

Everett, Wash.—Engineer Hoover has received instructions to prepare plans and specifications for grading, regrading, surfacing and sidewalking the thoroughfare from Broadway to Walnut St., a distance of 8½ blocks.

Seattle, Wash.—Following plans have been received from engineer: First Ave. South, paving, estimated cost, \$22,000; West Manford St., paving, etc., estimated cost, \$14,500; West Stacy St., paving, etc., estimated cost, \$13,100; Massachusetts St., paving, estimated cost, \$25,000; 16th Ave. South et al., paving, estimated cost, \$15,500; 16th Ave. South

et al., curbs, etc., estimated cost, \$5,500; Spokane St. drawbridge, replanking, estimated cost, \$1,500.

Seattle, Wash.—Plans have been received from engineer for paving of West Landers St., to cost \$11,200; paving of East Valley St., to cost \$10,600; paving of No. 45th St., to cost \$9,700, and for grading 10th Ave. N. E., to cost \$13,200.

Tacoma, Wash.—Plans for extension of road from Alderton to Orting with paved highway are being prepared by county engineer. This road is one of several that commissioners are expected to order for construction during summer. Preparations are also being made to call for bids for extension of Pacific highway from Tacoma Speedway to Custer, a distance of about a mile and a quarter.

Beloit, Wis.—Bids will be received until 2 p. m., April 8, by public works committee for improvement of various streets. Estimate of quantities as follows: 128,000 sq. yds. paving, 85,300 lin. ft. combined curb and gutter and 500 lin. ft. covered gutter. Bids will be received on any or all of following types of pavement: Creosoted wood block, vitrified block, sheet asphalt, asphaltic concrete, reinforced two-course Portland cement concrete and tar macadam, mixed method, all on 5-in. concrete base.

Milwaukee, Wis.—Supt. Blodgett of department of street construction will soon advertise for bids from paving contractors for improvement of number of streets. Following thoroughfares will be paved: With asphalt, Royal Pl., from Prospect to Farwell; Irving Pl., from Farwell to Cambridge; 6th Ave., from Greenfield to Mitchell; 20th Ave., same limits; Harrison Ave., Tent to American; Cleveland Ave., same limits; 16th St., Concordia to Finn Pl., with stone blocks; Lee St., from Booth to Bremen; Menomonee St., from Milwaukee to Jackson; with creosoted blocks, Lee St., from Booth to Holton.

Milwaukee, Wis.—The Beloit Rd., from south limits of West Allis to west county line, a stretch of 4½ miles, will be paved with concrete. Bids for 18-ft. highway have been opened by the county board committee. Contracts will be awarded by county board. One-half mile of Mukonago Rd., from Oklahoma Ave. to west county limits, will be paved with concrete. It will be a 16-ft. roadway. Contracts will be awarded by county board for laying 16,000 ft. of curb and gutter on the Watertown plank road past the county institutions in Wauwatosa.

Sparta, Wis.—City has rejected all bids for 4,200 yds. brick paving and will do work itself. Prices are wanted on 170,000 paving brick.

Superior, Wis.—Resolution has been passed adopting specifications for improvement of Tower Ave. from 58th St. to the city limits at the South End and the Board of Public Works directed to advertise for bids for paving.

CONTRACTS AWARDED.

Los Angeles, Cal.—For improvement of San Marino St. and Oxford Ave: The California-Arizona Construction Company, at prices named: \$1.70 per lin. ft. for grading to proposed finished surface of San Marino St., Specifications No. 96; 14.9-10 cents per sq. ft. for asphalt paving, Specifications No. 96; .053-10 cents per sq. ft. for cultivating, tamping and oiling, Specifications No. 98; 30 cents per lin. ft. for cement curb, class A, Specifications No. 88; 11 cents per sq. ft. for cement sidewalk, Specifications No. 84; 20 cents per sq. ft. for concrete gutter, Specifications No. 91; \$1,521 for storm drains and appurtenances, complete, Specifications No. 87; \$1.70 per lin. ft. for grading to proposed finished surface of Oxford Ave.

Pasadena, Cal.—Andrew Holloway has been awarded contract for improvement of Worcester Ave. from Colorado St. to point 170 ft. north of Ramona. His bid was \$5,819.52 for paving, curb and gutter.

Santa Ana, Cal.—Three bids have been received for building paved road from Olive westward to connect with Anaheim Rd. Contract went to Hart & Dusey, whose last good roads job in the county was the Buena Park Rd., at \$7,550.54. Other bids were: George Wiegand, \$7,636.50; M. L. Hubermann, \$8,328.42.

Meriden, Conn.—For 9,239 sq. yds. wood block pavement to L. Sergio, 185 Lewis Ave., Meriden, at \$29,169.70, and for 2,507 sq. yds. brick paving to Thos. Kearney at \$3,387.76.

New Haven, Conn.—For constructing new concrete sidewalks, to Richard Faulkner, 162 Read St.

Chicago, Ill.—By board of local improvements, for construction of concrete curb, grading and paving with vitrified paving brick on 2-in. sand and 6-in. Portland cement concrete, joints filled with coal tar, on various streets, to Central Paving Co., 179 W. Washington St.; P. J. O'Brien, 9 S. La Salle St., Marquette Const. Co., 133 W. Washington St.; Contracting & Material Co., 10 S. La Salle St.; John Dillon, 179 W. Washington St., and Jas. A. Sackley Co., 1004 S. Keeler Ave., and for grading and paving with 7-in. Portland cement concrete, to R. R. Anderson Co.

Edwardsville, Ill.—G. R. Hyten, contractor, with offices at 200 Linden Ave., has been awarded contract for construction of rock roadway on Marine Rd. east of town at meeting of Highway Commissioners and town clerk. His bid was \$4,190.

St. Louis, Ill.—At meeting of Board of Local Improvements, bid for improvement of Twenty-fifth Street from Morris Avenue, near E. & O. Railroad tracks, to Lynch Avenue, was awarded to Keeley Bros., East St. Louis contractor, for \$28,842.90. Curbing and guttering was also awarded to same firm at cost of 35 cents per lineal foot.

Galesburg, Ill.—For improvement of North Cedar and Sanborn Sts., to J. E. McAuley, of Galesburg, at \$13,925.08.

Moline, Ill.—To A. E. Rutledge, Rockford, Ill., at \$95,640, for 37,600 sq. yds. of brick pavement in Fifteenth Ave. pavement district and Fourth St. pavement district.

Pekin, Ill.—Bids for paving improvement to be known as Second and State St. District Improvement, have been opened at city hall. There were five competitive bids for district and it was found after consideration of bids that Jansen & Zoeller, of Pekin, had lowest bid. Contract will be awarded to that firm. Bids submitted were as follows: Jansen & Zoeller, Pekin: Finished pavement, \$1.75 per sq. yd.; curbing, 25 cts. per lin. ft.; concrete curbing, 27 cts. per lin. ft.; resetting curb, 10 cts. per ft. Barnswalt Construction Co., Peoria: Finished paving, \$1.78 per sq. yd.; curbing, 24 cts.; concrete curb, 22 cts.; resetting curb, 9 cts. Chas. T. McElmery, Chicago: Finished paving, \$1.80½ per yd.; curbing, 29 cts.; concrete curbing, 30 cts.; resetting curb, 13½ cts. McColman Construction Co., Decatur: Finished pavement, \$1.80½; curbing, 35 cts.; concrete curbing, 30 cts.; resetting curb, 15 cts. D. A. Meyers, Peoria: Finished paving, \$1.82; curbing, 35 cts.; concrete curbing, 30 cts.; resetting curbing, 15 cts. Paving is to be of brick, Alton, Barr, Carter or any other which meets specifications, and will be laid on 5-in. concrete base. Protecting curb will be 6 ins. in thickness and filler will be asphalt.

Springfield, Ill.—By State Highway Commission, to Grohne Construction Co., Joliet, at \$12,866, for road work in Bureau County, sections A and B.

Angola, Ind.—For 8,400 sq. yds. asphalt block, only bidder was the Brooks Const. Co., Ft. Wayne, Ind., at \$2.15 per sq. yd.

Fort Wayne, Ind.—By Board of Works for improvement of Smith St. with Trinidad Pitch Lake asphalt to Grace Construction Co. at \$6.71 per lin. ft.

Indianapolis, Ind.—Contract has been awarded by Board of Public Works to Union Asphalt Construction Co. for asphalt pavement in East New York St. from Arsenal Ave. to Randolph St. Contract price is \$7,601.10.

Clarinda, Ia.—To J. S. McLaughlin & Sons, Red Oak, Ia., for \$23,195, for construction of 14,420 yds. concrete pavement, \$1.32, and 11,350 lin. ft. curb, \$0.34. M. G. Hall is Engineer, Centerville.

Mason City, Ia.—For 23,000 sq. yds. Trinidad St. asphalt to Bryant Paving Co., Waterloo, Ia., at \$1.63 per sq. yd. and 36 cts. for curb. Total, \$42,342. F. P. Wilson is City Engineer.

Topeka, Kan.—To Olson-Schmidt Construction Co., Ballinger Bldg., St. Joseph, Mo., contract for 30,000 sq. yds. vertical fibre brick on 5-in. concrete base, 14,000 lin. ft. curb and gutter, 20,000 cu. yds. grading, 4,000 lin. ft. storm sewer 45 ins. to 10 ins. in diameter, at total of \$78,468.

Louisville, Ky.—Street construction contracts calling for expenditure of about \$135,700 have been let by Board of Public Works. Board rejected bids for construction work in seven alleys, amounting to about \$13,000. These bids were considered to be too high. In asphalt lettings, the Bickel Asphalt Paving Co. was given contracts for following work: Kentucky St., from 18th to 21st, from 22d to 26th; Onyx, between

Coral and Bellaire; Bellaire, between Frankfort and Letterie; 33d, from Broadway to Garland; 34th, from Broadway to Garland. The Louisville Asphalt Co. received contracts on the following: 35th, Broadway to Garland; 36th, Broadway to Garland; 38th, Broadway to Garland; Sutcliffe, Broadway to Garland; 37th, Broadway to Doerhoefer; Kentucky, 21st to 22d. Vitrified brick awards were made as follows: The G. W. Gosnell Co., Hill, 17th to 18th, and Zane, 19th to 11th; the L. W. Hancock Co., Johnson, Market to Jefferson. The last-named is the new street alongside the Bourbon Stockyards.

Baltimore, Md.—To Bond & Fideli, Vickers Bldg., city, at \$24,872, and Ambler & Davis, Harrison Bldg., Philadelphia, Pa., at \$13,103, for concrete roadways, contracts Nos. 10 and 9, respectively.

Baltimore, Md.—State Roads Commission has let a number of contracts for road work. Among awards was that on State Blvd., between Glen Burnie and Pumphrey's stations, a distance of 3.92 miles. Successful bidder was Fisher & Carozza, at \$43,954.92.

Beverly, Mass.—Committee on Public Service and aid has awarded contracts as follows: Granolithic sidewalks to Crosby & Cann, for \$1.70 per sq. yd. Edgestones, to the Lovejoy Granite Co. of Milford, N. H., for 54 cts. per lin. ft. Laying brick sidewalks, to John C. Fowler, for 49 cts. a sq. yd. The contract for setting edgestones was awarded Edmund M. Cahill, and for the motor lawn mower to the Whitcomb-Carter Co.

Lynn, Mass.—The County Commissioners have awarded contract for laying bituminous macadam on floor of Rock bridge, Haverhill. Work was divided into two substances, the new part of three spans of 950 sq. yds. of heavy pavement, while old part is 370 sq. yds. of lighter concrete. Contract was awarded to Michael McDonough of Swampscott, at \$1.50 a yd. on the new part and \$1.25 on the other. Other bidders were: Timothy A. Monahan of South Hamilton, at \$1.94 and \$1.50 a yd. respectively, and John Cashman & Son Co. of Boston, \$2.70 and \$2.20 a yd. respectively.

St. Louis, Mo.—To Webb Kunze Constr. Co., of St. Louis, for brick paving on following streets: Scanlan, Ivanhoe and Tyler Aves., to include about 17,000 cu. yds. grading, 14,000 ft. granite curb and 25,000 sq. yds. brick pavement; total cost, about \$57,000.

Missoula, Mont.—For paving with bitulithic Stevens St. by City Council to J. C. Maguire, Lewiston, at \$28,771.

Columbus, Neb.—For bitulithic pavements on streets to Wm. Horriban, Des Moines, Ia., at \$1.94½ per sq. yd. for total of about \$97,000.

East Orange, N. J.—For 255,000 gals. of non-asphaltic road oil, to W. S. Logan, Newark, at about \$14,000.

Freehold, N. J.—Charles E. Burd, of Red Bank, has been awarded contract for building of Bay Ave., Highlands. His bid was \$10,153. Other bidders and their figures were: Frank C. Byram, \$10,987.50; Edw. T. Bennett, \$11,386.50; Parker-Bonner, Inc., \$16,582.50.

Long Branch, N. J.—Following contracts have been awarded: Henry Curtis, sidewalks; William H. Alexander, interlocking curbing; John C. Clark, blue-stone work. Mr. Woolley also had the clerk instructed to advertise for gravel.

Albany, N. Y.—Proposals have been opened for 12 contracts, cost of which will be over \$600,000. Greater number were for work in northern and western counties. Only one Albany contractor was successful, John F. Lewis, who was lowest bidder at \$3,474 for 22-100ths of a mile on Broadway and Silver St., Saranac Lake village. Lowest bidders for pieces of work in this section were: For Harlemville - Mellenville, Columbia county, 4.97 miles, James Garafano & Sons, Mt. Vernon, at \$60,817; Rensselaer-DeFreestville, Rensselaer county, 2.11 miles, Belmar Contracting Co., Troy, at \$26,814.

Hudson, N. Y.—There are thirteen companies bidding for building of Harlemville Mellenville State Rd., which is 4.97 miles long. The Russo-Parker Construction Co. of this city is low with figures of \$58,922. List follows: Brady & Oltarsh, New York City, \$61,736.10; Lewis Loughi & Bro., Torrington, Conn., \$66,183.15; James Garafano & Sons, Mt. Vernon, \$60,817.40; C. W. Tyrone, Boyntonville, \$62,549.85; Spuyten-Duyvil Cons. Co., New York City, \$63,153; Russo-Parker Cons. Co., Hudson, \$58,922; James E. Martin, Utica, \$63,603.40; John

L. Hayes Cons. Co., Yonkers, \$60,492.50; **James L. Kehoe, Newburgh,** \$63,606.35; **Harris-Rose Cons. Co., New York City,** \$62,811.60; **Robert I. Gleason, Albany,** \$64,530.35; **H. B. Sroul Cons. Co., Inc., Peekskill,** \$61,654.90; **Criswell & Mallory, Inc., Mechanicville,** \$63,996.60.

Oneonta, N. Y.—To Phelan & Sullivan, of Utica, for \$19,551, for construction of 13,700 sq. yds. bituminous macadam pavement, with concrete curb and gutter and curb protection bar.

Schenectady, N. Y.—The Mixed Stone Co., of Cobleskill, has been given contract for crushed stone at \$1.05 a net ton, outbidding several local bidders.

Delaware, O.—For constructing roads contracts have been awarded as follows: **Culver Creek Rd., Porter Township,** 2.8 miles, to Chas. Perfect and H. W. Davis, Sunbury, at \$12,575; **Bowers Rd., Brown Township,** 1.27 miles, J. L. Edwards, Sunbury, \$5,325; **Hatten Rd., Brown Township,** 1.13 miles, Chas. F. Rodenfels, Delaware, R. D. No. 2, \$3,200; **Seldom Seed Rd., Liberty Township,** 2.74 miles, Chas. Stith, Delaware, \$7,475; **Ford Rd., Liberty Township,** 1.52 miles, J. McNamara, Delaware, \$3,990; **Concord Rd., Concord Township,** R. B. Thomas, Delaware, R. D. No. 5, Sect. "N," \$9,650, and Sect. "S," \$7,500; **Todd St., Kingston Township,** 3.4 miles, Edson Linnabary, Galena, and N. C. Farber, 151 Franklin Ave., Columbus, at \$15,750.

Hamilton, O.—For paving Hanover St. by Bd. Control to Andrews Asphalt Paving Co., Hamilton, at \$32,022.

Hamilton, O.—Formal award of contract for oiling local streets will be awarded to Arthur Berry at his bid of 5 1/2 cts. a gallon.

Youngstown, O.—By County Commissioners for paving West Rd. to I. W. Coy, of Calla, at \$8,444. Arthur L. Schmidt is Co. Engr.

Durant, Okla.—To Ammonst Baum, city, at \$22,755, for 17,600 sq. yds. water-bound macadam and 8,200 ft. curb and gutter and 5,000 cu. yds. excavation and embankment.

Salem, Ore.—Of the 15 bids submitted to state highway commission for construction of Mitchell Point section of Columbia highway, in Hood River county, that of Standifer-Clarkson company, of Portland, is the lowest. This company's bid was \$40,343.50 and is \$2,378.50 lower than bid of Copenhagen Brothers, Portland, which was second lowest.

Wilkes-Barre, Pa.—The State Paving Co. of this city has been awarded bulk of street paving contracts by Council. To State Paving Co. contract for paving with sheet asphalt at \$1.82 per sq. yd. the following streets: Magnolia and O'Neill Aves., Emily court, and Charles, Walnut, South Welles, Danna, Kinney, Church, Maple, Lincoln, Beaumont, South Hancock and Blackman Sts. and Kirkendall lane. Also contract for curbing all of these streets with White Haven red stone at 78 cts. per lin. ft. To the State Paving Co. the contract for paving Main and North River Sts. and the resurfacing of Wood St. with sheet asphalt at \$1.82 per sq. yd. To the State Paving Co. the contract for White Haven red stone curbing at 78 cts. per lin. ft. on North River St. from the court house to the City Hospital. To the State Paving Co. for paving Blackman and Stanton Sts. with Toronto paving blocks at \$2.28 per sq. yd. and with White Haven Belgian blocks on the heavy grade; also for curbing these streets with White Haven red stone at 78 cts. per lin. ft. To the State Paving Co. the contract for paving Race St., Hollenback Ave., South Hancock St. and Jones St. with Porter National paving blocks at \$2.33 per sq. yd. on the grade; also for curbing these streets with White Haven red stone at 78 cts. per lin. ft. To the State Paving Co. the contract for repaving Grove and High Sts. with Metropolitan brick at \$2.18 per sq. yd.; also for the curbing of these streets with White Haven red stone at 78 cts. per lin. ft. To the B. G. Coon Construction Co. the contract for paving Kidder and Scott Sts. with Toronto paving blocks at \$2.22 per sq. yd. and Conyngham St. with Keystone brick at \$2.04 per sq. yd.; also curbing with White Haven red stone at 78 cts. lin. ft. To the Herick Construction Co. the contract for paving South St. with Clearfield paving blocks at \$2.28 per sq. yd.; also curbing with White Haven red stone at 78 cts. per lin. ft. To Frank Anstett the contract for paving Foster lane with cobblestones at 69 cts. per sq. yd., to be furnished by the city, and curbing of White Haven red stone at 82 cts. per lin. ft.

Newport, R. I.—Following bids have been received for road machinery, as follows: Acme Co., Boston—One double

watering cart, \$250; three single watering carts, \$205; tar heating tank, 350 gals., \$225. **P. F. McDonald & Co., Boston**—Two standard sanitary carts, \$315 each. **New England Road Machinery Co., Boston**—Two sanitary carts, \$200 each; two asphalt heaters, \$300 each. **Harold L. Bond Co., Boston**—Two asphalt heaters, \$270 each. **Fred O. Johnson, Boston**—Two asphalt heaters, \$320 each. **Dyar Supply Co.**—One sand spreader, \$365; two sanitary carts, \$283 each; two sanitary carts, two-wheel, \$215 each; two asphalt heaters, \$325 each; one double watering cart, \$325 each; three single watering carts, \$300. **Studebaker Co., Boston**—Three watering carts, \$285 each; one watering cart, \$300. **Peckham Co., Newport**—Two asphalt heaters, \$295 each; three single watering carts, \$298; one double watering cart, \$348. Contract for watering carts was awarded to Studebaker Corp. and for asphalt heaters and sand spreader to Dyar Supply Co.

Newport, R. I.—There were several bids received for oil for roads, as follows: **Indian Refining Co., New York**—Asphalt 40.45 per cent .0538 cts. per gal.; neutral .0650 cts. **Supreme Oil Supply Co., Fall River**—Asphalt 45 per cent, 5 cts.; asphalt 65 per cent 5 1/2 cts. **Island Petroleum Co.**—Emeral, no-asphalt, .0650. **Darling Slade Construction Co.**—Tar binder, No. 1, 6 4-5 cts.; No. 2, 3 4-5 cts. **Standard Oil Co.**—Non-asphalt, 5 15-100 cts.; light, 4 72-100; Standard, 3 69-100. **Dustoline Co.**—Dustoline, 7 1/4 cts.; A. Lamson road oil, 6 1/2 cts.; B. Lamson road oil, 5 1/2 cts. **Peckham Co.**—Non-asphalt, .064; heavy grade, .067; Tarvia B., .07. Contract was awarded to Standard Oil Co., New York City.

Corsicana, Tex.—For building pike road from main road to Fish Tank No. 2 to Mr. Worthington.

Norfolk, Va.—Following contracts have been awarded by Board of Control as follows: To B. A. Parris for hauling 210 cu. yds. of crushed stone to Elmwood and Cedar Grove cemeteries. To P. Linehan & Sons of Greystone, N. C., for 2,400 lin. ft. of granite curbing and 20 sets of corner stones. To Standard Oil Co. for 35 tons of asphalt at \$14 a ton.

Seattle, Wash.—For grading 32d Ave. N. E. to B. H. Petley at \$12,293.50.

Milwaukee, Wis.—By County Highway Commissioner, Milwaukee, for Watertown, Silver Springs and Howell Rds., as follows: Watertown Rd. to White Constr. Co., Ry. Exchange Bldg., Milwaukee, as follows: 4,500 cu. yd. excav., 65 cts.; 33,000 sq. yd. sheet asphalt on concrete base, \$1.65; 43 cu. yd. concrete culverts, \$10; 10 per cent for extra work; total, \$57,805. **Badger Constr. Co., Ry. Exchange Bldg., Milwaukee,** bid also for the work, \$60,192. **Silver Springs and Port Washington Rds. to Gumz, Gutkuecht & Wusson, M. & M. Bank Bldg., Milwaukee,** as follows: 12,600 cu. yd. grading (excav.), 48 cts.; 42,700 sq. yd. concrete pav., type A expansion joints, 71 cts., or 42,700 sq. yd. type B felt only, 69 cts.; 195 cu. yd. concrete culverts, \$8; 10 per cent for extra work; total if type A is used, \$37,925, or for type B, \$37,071. **Howell Rd. to Gumz, Gutkuecht & Wusson, M. & M. Bank Bldg., Milwaukee,** as follows: 8,950 cu. yd. excav., 48 cts.; 21,200 sq. yd. concrete pav., type A expansion joints with steel plates, 71 cts.; 21,200 sq. yd. concrete pav., type B joints, with felt only, 69 cts.; 90 cu. yd. concrete culverts, \$8; 10 per cent for extra work; total, \$20,068 for Type A, or \$19,644 for Type B. **County furnishes cement.**

Mt. Horeb, Wis.—To Nicholas Quinn, of Madison, Wis., for construction of 19,300 sq. yds. concrete paving, 7,500 lin. ft. curb and gutter, and 4,500 yds. grading.

Superior, Wis.—City Commission has awarded contract for paving Belknap St. from Clough Ave. to West 7th St. to Contractor John Diffor. Belknap St. will be paved with concrete. Contractor was low bidder in field of 12. His price was \$22,567.30.

SEWERAGE

Mesa, Ariz.—At meeting of members of sewer committee of City Council tentative arrangements were perfected whereby first step towards installation of sewer system for Mesa, adequate not only for present needs, but calculated to take care of sewage of Mesa several years hence, was taken.

Auburn, Cal.—Trustees are discussing matter of calling for bond issue of about \$25,000 to pay for sewer extensions, a septic tank, a fire truck and laying of sidewalks where official grades have been changed.

Greenwich, Conn.—Plans are being prepared for sewage disposal plant to cost \$180,000. Clyde Potts, 30 Church St., New York, N. Y., is engineer. Albert S. Mead is clerk of sewer comm.

Stamford, Conn.—Definite proposals for erection of sewage disposal plants will be submitted by the W. G. Cornell Company of New York and the Sanitation Corporation of New York.

East St. Louis, Ill.—Board has arranged to present to City Council at next meeting ordinance authorizing establishment of Sewer District No. 2, in Winstanley, to take in that territory from Twenty-first street on west to Fifty-fourth street on east, and from Caseyville road on north to Broadway on south, estimated cost of which is \$346,100.

Council Bluffs, Ia.—Resolution has been adopted for construction of following sewers: Sewers on Ave. G from 8th St. to 13th St., 1,200 ft. of 15-in. sewer; 400 ft. of 12-in. sewer; 400 ft. of 10-in. sewer; 1,224 ft. of 6-in. sewer; 68 wyes. Sewers on Ave. F from 5th St. to 13th St., 1,200 ft. of 15-in. sewer; 400 ft. of 12-in. sewer; 400 ft. of 10-in. sewer; 1,224 ft. of 6-in. sewer; 68 wyes. Sewers on Ave. E from 8th St. to 13th St., 1,200 ft. of 15-in. sewer; 400 ft. of 12-in. sewer; 400 ft. of 10-in. sewer; 1,224 ft. of 6-in. sewer; 68 wyes. Twelve man-holes. Sewers on North 6th St. from Ave. F to Ave. G, 350 ft. of 8-in. sewer.

Council Bluffs, Ia.—A sewer ordinance of necessity has been passed covering alleys parallel to Broadway between 13th and 17th Sts. on Aves. A, B, C and D.

Emporia, Kan.—Bids will be advertised for storm sewer on 13th Ave. between State and Center Sts. City engineer recommends a 24-in. vitrified tile sewer.

Andover, Mass.—Plans have been drawn by McClintock & Woodfall, engineers, for sewer system extension to Abbott village.

Kalamazoo, Mich.—A resolution providing for general issuance of bonds for drainage purposes in all counties of State will be submitted to voters at spring election on April 5.

St. Cloud, Minn.—City clerk has been instructed to advertise for bids for extension of southside sewer, bids to be opened on April 13th.

Poplar Bluff, Mo.—City Council has accepted plans and specifications for sanitary sewers in Sewer District No. 2. Estimated cost of work, \$19,956. Pipe included in said work is 6 ins., 8 ins. and 12 ins. and one ejector station. Contract for work will be let in about two months. E. C. Thomas is city engineer.

St. Joseph, Mo.—Three sewer jobs are to be advertised as follows: District sewer No. 9, beginning at Seventh and Patee, \$525; district sewer No. 128, Roosevelt, from St. Joseph Ave. to Ninth St., \$1,500; district sewer No. 72, in the alley from 21st and 22d, Angelique to Sylvania, \$550.

Asbury Park, N. J.—Commissioner Pit-tenger has been instructed to advertise for bids for relaying of 1,070 ft. of 18-in. sewer main in Oak Bluff Ave.

Elizabeth, N. J.—Ordinance has been passed to build and construct a sewer, together with house drainage connections in Morris Ave. from its present terminus toward city line for distance of about 250 ft. and to cause house connections to be carried and constructed from said sewer to curb line of street.

Hammonton, N. J.—At special meeting of Council it was decided to issue \$108,500 in sewer bonds to cover costs of sewer system and disposal plant recently completed at this place. This bond issue represents total cost of sewer line and disposal plant, with exception of few hundred dollars. The house connection contract is not included in the above.

Paterson, N. J.—An ordinance to provide for construction of sewers in certain streets and avenues and portions thereof has been passed.

Perth Amboy, N. J.—Notice has been given of intention to lay a 12-in. sewer in Kennedy St. from Donald Ave. east to Alpine Cemetery, and in Pacific Ave. from Kennedy St. to a point 150 ft. south of Hall Ave.

Roselle, N. J.—Ordinance to construct 450 ft. of 8-in. vitrified sewer in Chandler Ave. has been passed on final reading by Borough Council and bids for work will be received at next meeting.

Trenton, N. J.—Ordinances have been passed for construction of sewers in various streets.

Binghamton, N. Y.—Alderman James Watson of 11th ward expects to ask Council to call bonding election to determine whether bonds to amount of \$139,-

000 shall be issued for construction of sewer system in that section of city along Brandywine creek.

Fredonia, N. Y.—Frederick Wing, White Building, Buffalo, has prepared plans for construction of sewer system and same have been approved by state board of health.

Hunter, N. Y.—Sewer system will be constructed and plans have been approved by State Board of Health.

Rochester, N. Y.—At its meeting on March 31, the Board of Contract and Supply will receive bids for construction of big sewer tunnel in Main St West and East and in Front St. Estimated cost of work is \$145,000. Plans and specifications have been completed and bids are now being advertised.

Syracuse, N. Y.—Two sewer-cleaning machines will be purchased without advertising for bids, cost not to exceed \$1,100.

Marion, O.—Resolution to construct sanitary and storm-water sewer from Silver St., north on Lee St., to Garden City pike, has been adopted after three necessary readings.

Piqua, O.—Resolutions have been adopted for construction of sewers in various streets.

Toledo, O.—The Sanitary Engineering Department of Lucas county, O., is preparing plans for a sewage pumping station to have a maximum capacity of 1,000 gals. per minute. It has not yet been definitely decided to install ejectors or centrifugal pumps. This station will be first of several that have to be built in near future. Wm. H. Gould is County Sanitary Engr.

Youngstown, O.—Resolution has been passed to sewer Brockway Ave. from Mahoning Ave. to the north line of the Mahoning Ave. sewer district.

Beaver Falls, Pa.—Special election will be held in City of Beaver Falls May 15, between hours of 7 a. m. and 7 p. m. to vote on proposed bond issue of \$215,000. The first issue is for \$40,000, which amount will be used for construction of disposal plant and outfall sewer for completion of sanitary sewer system; second issue is for \$75,000, and is for purpose of changing form of indebtedness, and third issue is for \$100,000, which sum will be used in paving of certain streets and avenues in city.

Downingtown, Pa.—Borough Council has passed ordinance providing for issuance of sewer system and disposal plant bonds to the amount of \$70,000.

Walterboro, S. C.—Plans have been prepared by H. S. Jaudon Engineering Co., Savannah, Ga., for construction of sewer system, to cost about \$13,000.

Cleburne, Tex.—Election has resulted in favor of issuing bonds for sewerage system in sum of \$180,000.

Seattle, Wash.—Plans have been received from engineer for sewer on Market St. to cost \$1,980.

Janesville, Wis.—Bids will be received 2 p. m., April 16, for construction of sewers in District No. 5 (about 225 lin. ft. of 8-in. sewers and 1 lamp hole); in District No. 10 (about 450 lin. ft. 8-in. and 292 lin. ft. 12-in. sewers, 2 manholes and 1 lamp hole); in District No. 11 (about 842 lin. ft. 8-in. sewers and 2 manholes); in District No. 14 (about 850 lin. ft. 8-in. sewers, 2 manholes and 2 lamp holes); in District No. 15 (about 2,151 lin. ft. 8-in. sewers, 329 10-in., 7 manholes and 2 lamp holes. C. V. Kerch is City Engineer.

Milwaukee, Wis.—Construction of following sewers has been recommended: Pipe sewer in 55th St., from Elm St. to North Ave.; pipe sewer in 16th St., from Burleigh St. to a point 590 ft. north of Burleigh St.; pipe sewer in North Ave., from 52d St. to 53d St.; pipe sewer in 34th St., from Fond du Lac Ave. to Burleigh St.; pipe sewer in 54th St., from Elm St. to North Ave. South Sewerage District—Pine sewer in Pennsylvania Ave., from Oklahoma Ave. to Wyoming Pl., and in Wyoming Pl., from Pennsylvania Ave. to Kinickinnle Ave.; pipe sewer in Delaware Ave., from Oklahoma Ave. to a point 140 ft. south of Fernwood Ave.; pipe sewer in Pine St., from Russell Ave. to Montana St.; pipe sewer in Montana St., from 6th Ave. to 7th Ave., and in 7th Ave., from Montana St. to Dakota St.

CONTRACTS AWARDED.

Long Beach, Cal.—By Board of Public Works for constructing ocean outlet for main outfall sewer, requiring about 1,100 ft. 36-in. c. i. pipe, to Mercereau Bridge & Construction Co., Pacific Electric Building, Los Angeles, at \$29,007.

Chicago, Ill.—By board of local improvements, for adjusting sewer manholes and catch-basins, inlets, etc., on

various streets, to Connelly & Dunning; R. F. Conway Co., 1931 Mendell St.; American Asphalt Paving Co., 133 W. Washington St.; Alex N. Todd; Standard Paving Co.; John Dillon, 179 W. Washington St.; Marquette Const. Co., 133 W. Washington St.; F. P. McCormick, 133 W. Washington St.; Central Paving Co., 179 W. Washington St., and Farr Bros. Co.

Chicago, Ill.—By board of local improvements for construction of tile pipe sewers, etc., in various streets to Simon Ryan, Michael Pontorelli, The Ryan Co., James Stenson, Angelo Santucci, P. J. McNulty Co. and George Pontorelli.

Ames, Ia.—To Moore-Sieg Construction Co., Waterloo, Ia., contract for construction of 10,000 ft. of sanitary sewer, 15-in. to 8-in. diameter.

Chicopee, Mass.—For sewer construction to Wm. E. Donnelly, Chicopee Falls, Mass., at 77 per cent off list.

Detroit, Mich.—For installing sewer system on Belle Island Park, to include sewers and manholes, treating plant liquid chlorine disinfectant apparatus and pumping plant as follows: Sect. A, to Jaynes & Affelt; Sects. B and C, to Geo. R. Cook; Sects. D, E, F, G, H and I, to Wm. Blanck & Co. Total cost about \$90,000.

St. Paul, Minn.—Committee has awarded to Doherty & Son sewer work to amount of \$618, to Andrew Soderquist a \$200 sewer contract and to O'Neill & Preston a \$6,900 sewer contract.

Newark, N. J.—For construction of sewer on Amsterdam St., to Cardell & Romano, Montclair, N. J., at \$4,002, and for construction of Clifford St. sewer, to Michael Stefanelli, Newark, N. J., at \$1,001.

Granville, O.—For constructing sewers to Chapman & Glover, Lorain, at \$19,388, and for disposal plant to G. E. Scott Eng. Co., of Norwalk, at \$14,316. Theo. S. Johnson is Engr., Granville.

Sandusky, O.—By Board of Control contract to Brohl and Appel and Henry Homberger, joint bidders, for furnishing of labor and material for private sewer and water connections. Total bid was \$2,695.90.

Upper Darby, Pa.—Contracts have been let for construction of sewerage systems in Keystone and Garrettford district. This was part of sewerage system to cost \$150,000. Part of work is already under way. Contracts let were as follows: Section 3, Keystone, let to Fred T. Buckles, Jr., \$22,557; section 4, Keystone, Martin and Miller, \$13,577.75; section 5, Keystone, Cantrell Construction Co., \$34,146; section 2, Garrettford, McNichol Paving & Construction Co., \$49,899.

Seattle, Wash.—For construction of sewers on Lakeside Ave. to Thos. Scalzo at \$23,959.35 and on 38th Ave. South to J. E. Creque at \$596.

WATER SUPPLY

Oakland, Cal.—Plans for further extensions of high pressure salt water system, Oakland's greatest safeguard against disastrous fires in business section, and for construction of second pumping plant on estuary, near foot of Market St., are being prepared by engineering department of city, under direction of William J. Baccus, commissioner of streets.

Sacramento, Cal.—Plans and specifications for new water main have been accepted by City Commission after four hours of consideration. Plans and specifications were rearranged by Professor Charles Gilman Hyde and expert G. H. Wilhelm. They estimate cost of system at from \$800,000 to \$850,000. A 36-in. pipe will be installed in place of two 40-in. pipes, as provided in the original plan. The high pressure system in the business section is eliminated as unnecessary at present.

Washington, D. C.—A firm in South America informs all American consuls that it desires to receive price lists, etc., from American manufacturers which are in position to make prompt shipments of 2½, 4 and 6-in. cast-iron pipes, cast-iron fittings, brass and lead fittings. Prices should be quoted f. o. b. New York, or, if possible, c. i. f. destination. It is stated that firm is prepared to pay cash. Correspondence may be in English. No. 16066, Bureau of Manufactures.

Alma, Ga.—Election has resulted in favor of issuing water bonds to amount of \$15,000.

Paducah, Ky.—The Paducah Water Company is preparing and has plans drawn for installation of new water mains in business section, improvements to cost approximately \$14,000. Work of installing new pipes will be commenced

about April 1. Sixteen-inch mains will be laid on Washington St. from Second to Tenth St. and from Tenth to Broadway. The same size mains will be laid on First St. to Jefferson, from First to Second on Jefferson, thence to Monroe and from Second and Monroe to Eighth St.

Beverly, Mass.—Alderman Ferrier has introduced order providing for appropriation of \$2,000 for laying water pipes in Mathias and Sturtevant Sts. and Echo Ave. Same has been referred to public service committee.

Brookline, Mass.—Brookline's adjourned town meeting has voted \$200,000 for covered filter and basins with equipment needed for improving water supply and amendment was passed to give Brookline residents preference in employment on the job.

Salem, Mass.—Water supply commission has awarded contracts for furnishing equipment for auxiliary water supply at total cost of \$13,343.

Saginaw, Mich.—A petition bearing 2,764 signatures has been presented to Council, asking that "the proposition to ratify bond issue of \$500,000 to be used for water main extensions and in building modern filtration plant at present east side water works," be submitted to voters at election April 5.

Duluth, Minn.—Council has directed Commissioner Merritt to advertise for bids for construction of a 1,000,000-gal. reservoir tank at Woodland.

Camden, N. J.—Finance Committee has recommended for adoption ordinance providing for \$50,000 bond issue for an auxiliary station for water plant at Delair.

Bloomington, N. Y.—Proposition to maintain village artesian well system has been carried.

Brocton, N. Y.—Election has resulted in favor of issuing water system bonds to amount of \$20,000.

Elmira, N. Y.—Bids will be received by Common Council of the City of Elmira, N. Y., until March 29, 1915, at 8 o'clock P. M., for purchase of Registered Water Bonds of said city in amount of \$1,500,000 for the purchase of the existing water system of the Elmira Water, Light & Railroad Company. L. C. Andrews is city clerk.

Peekskill, N. Y.—Purchase of 25 meters will be purchase by Superintendent.

Revena, N. Y.—Election has resulted in favor of issuing sewer system bonds in sum of \$10,000.

Yonkers, N. Y.—Measures approving laying of water mains in Winfred Ave. and Trenchard St. in Pondfield Rd., from Janvrin Ave. to Delwood Ave., and in Delwood Ave. to Gentian lane; in Frederic St. from Vineyard Ave. to Frederic Pl., have been all passed.

Durham, N. C.—Board of Aldermen have taken four decisive steps looking towards beginning new waterworks plant which is to be erected on Flat River. They have instructed engineer to advertise for bids on work that will have to be done and on supplies that will have to be purchased whether or not city purchases plant of Durham Water Co. They have instructed city attorney to see about sale of half a million dollar bond issue which will be necessary to construct the plant.

Marion, O.—Ordinances have been adopted for extension of water mains in various streets.

Middletown, O.—First reading has been given ordinance to provide for election for bonds to pay for extending water works in plan of greater system for Middletown, and also providing for bond election to submit proposal to people May 1. People will vote on \$100,000 bond issue.

Sandusky, O.—Five companies have submitted bids to furnish water meters to city for 1915. The minimum number to be furnished is 200. Board of control will take action. Offers submitted were on ½-inch meters; ¾-inch meters; one inch meters; 1½-inch meters; 2, 3, 4 and 6-inch meters. Competing companies are: The Hersey Manufacturing Co., Boston; Neptune Meter Co., Cincinnati; Thomson Meter Co., New York City and the H. R. Worthington Co., New York City.

Sebring, O.—Chester & Fleming, Pittsburgh, Pa., has been retained by water company to appraise water system in connection with expert appointed by city with view of selling system.

Springfield, O.—Upon recommendation of city manager legal department has been authorized to draft ordinance appropriating \$1,200 for purchase and installation of sprinkler system at the waterworks pumping station.

Springfield, O.—Ordinance appropriating \$1,000 for purchasing and installing